



NBS REPORT

9718

## THE SPECIFIC HEAT INPUT, $\rho(\partial H/\partial \rho)_P$ , OF OXYGEN

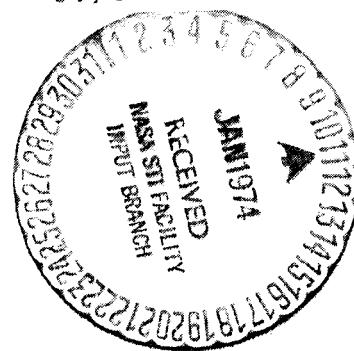
by

L. A. Weber

(NASA-CP-136632) THE SPECIFIC HEAT INPUT  
OF OXYGEN (National Bureau of Standards)  
35 F

A74-71315

Unclassified  
26843



**U. S. DEPARTMENT OF COMMERCE  
NATIONAL BUREAU OF STANDARDS  
BOULDER LABORATORIES  
Boulder, Colorado**

## NATIONAL BUREAU OF STANDARDS

The National Bureau of Standards<sup>1</sup> was established by an act of Congress March 3, 1901. Today, in addition to serving as the Nation's central measurement laboratory, the Bureau is a principal focal point in the Federal Government for assuring maximum application of the physical and engineering sciences to the advancement of technology in industry and commerce. To this end the Bureau conducts research and provides central national services in three broad program areas and provides central national services in a fourth. These are: (1) basic measurements and standards, (2) materials measurements and standards, (3) technological measurements and standards, and (4) transfer of technology.

The Bureau comprises the Institute for Basic Standards, the Institute for Materials Research, the Institute for Applied Technology, and the Center for Radiation Research.

**THE INSTITUTE FOR BASIC STANDARDS** provides the central basis within the United States of a complete and consistent system of physical measurement, coordinates that system with the measurement systems of other nations, and furnishes essential services leading to accurate and uniform physical measurements throughout the Nation's scientific community, industry, and commerce. The Institute consists of an Office of Standard Reference Data and a group of divisions organized by the following areas of science and engineering:

Applied Mathematics—Electricity—Metrology—Mechanics—Heat—Atomic Physics—Cryogenics<sup>2</sup>—Radio Physics<sup>2</sup>—Radio Engineering<sup>2</sup>—Astrophysics<sup>2</sup>—Time and Frequency.<sup>2</sup>

**THE INSTITUTE FOR MATERIALS RESEARCH** conducts materials research leading to methods, standards of measurement, and data needed by industry, commerce, educational institutions, and government. The Institute also provides advisory and research services to other government agencies. The Institute consists of an Office of Standard Reference Materials and a group of divisions organized by the following areas of materials research:

Analytical Chemistry—Polymers—Metallurgy — Inorganic Materials — Physical Chemistry.

**THE INSTITUTE FOR APPLIED TECHNOLOGY** provides for the creation of appropriate opportunities for the use and application of technology within the Federal Government and within the civilian sector of American industry. The primary functions of the Institute may be broadly classified as programs relating to technological measurements and standards and techniques for the transfer of technology. The Institute consists of a Clearinghouse for Scientific and Technical Information,<sup>3</sup> a Center for Computer Sciences and Technology, and a group of technical divisions and offices organized by the following fields of technology:

Building Research—Electronic Instrumentation — Technical Analysis — Product Evaluation—Invention and Innovation—Weights and Measures — Engineering Standards—Vehicle Systems Research.

**THE CENTER FOR RADIATION RESEARCH** engages in research, measurement, and application of radiation to the solution of Bureau mission problems and the problems of other agencies and institutions. The Center for Radiation Research consists of the following divisions:

Reactor Radiation—Linac Radiation—Applied Radiation—Nuclear Radiation.

<sup>1</sup> Headquarters and Laboratories at Gaithersburg, Maryland, unless otherwise noted; mailing address Washington, D. C. 20234.

<sup>2</sup> Located at Boulder, Colorado 80302.

<sup>3</sup> Located at 5285 Port Royal Road, Springfield, Virginia 22151.

# NATIONAL BUREAU OF STANDARDS REPORT

NBS PROJECT

NBS REPORT

27504-2750445

Nov. 1, 1968

9718

## THE SPECIFIC HEAT INPUT, $\rho(\partial H/\partial \rho)_P$ , OF OXYGEN

by

L. A. Weber  
Cryogenics Division  
Institute for Basic Standards  
National Bureau of Standards  
Boulder, Colorado 80302

This work has been supported by  
National Aeronautics and Space Administration  
Headquarters Fund Transfer No. R-06-006-046

### IMPORTANT NOTICE

NATIONAL BUREAU OF STANDARDS REPORTS are usually preliminary or progress accounting documents intended for use within the Government. Before material in the reports is formally published it is subjected to additional evaluation and review. For this reason, the publication, reprinting, reproduction, or open-literature listing of this Report, either in whole or in part, is not authorized unless permission is obtained in writing from the Office of the Director, National Bureau of Standards, Washington, D.C. 20234. Such permission is not needed, however, by the Government agency for which the Report has been specifically prepared if that agency wishes to reproduce additional copies for its own use.



U.S. DEPARTMENT OF COMMERCE  
NATIONAL BUREAU OF STANDARDS

# THE SPECIFIC HEAT INPUT, $\rho(\frac{\partial H}{\partial \rho})_P$ , OF OXYGEN

by

L. A. Weber

## ABSTRACT

The quantity known as the specific heat input,  $\rho(\frac{\partial H}{\partial \rho})_P$ , has been tabulated for oxygen at temperatures between the triple point and 540°R and at pressures up to 5000 psi.

Key Words: oxygen, properties of fluids, PVT, saturated liquid and vapor, specific heat input.

---

Certain thermodynamic properties of considerable interest to a relatively narrow segment of the scientific community have not been tabulated previously in our reports on cryogenic fluids. One of these properties is known as specific heat input, or sometimes DQ/DM, which is useful in calculations involving the storage of cryogenic liquids. This quantity may be defined as

$$DQ/DM = \rho(\frac{\partial H}{\partial \rho})_P = -\rho C_P \left[ (\frac{\partial P}{\partial \rho})_T / (\frac{\partial P}{\partial T})_\rho \right], \quad (1)$$

and is the amount of heat required to expel a unit mass of fluid from a storage vessel.

The total amount of heat absorbed in following the isobaric path AB in Fig. 1 is then,

$$Q = V \int_A^B \rho \left( \frac{\partial H}{\partial \rho} \right)_P d\rho, \quad (2)$$

where  $V$  is the total volume of the vessel, in cubic feet.

Along a subcritical isobar, path CDE in Fig. 1, the above calculation must be broken into three parts:

1. the compressed liquid region,
2. two-phase boiling fluid,
3. vapor region.

In step 2, above, the heat required to expel a unit mass of vapor is

$$Q/\delta m = L_v / \left( 1 - \rho_v / \rho_l \right) \quad (3)$$

where  $L_v$ ,  $\rho_v$ , and  $\rho_l$  are the heat of vaporization and the densities of vapor and liquid under saturation conditions. The total heat absorbed along path CDE then is

$$Q = V \left[ \int_C^D \rho \left( \frac{\partial H}{\partial \rho} \right)_P d\rho + \rho_l L_v + \int_D^E \rho \left( \frac{\partial H}{\partial \rho} \right)_P d\rho \right]. \quad (4)$$

In (3) and (4) it is assumed that only vapor is expelled from the two-phase system.

The quantities in the above equations were calculated by means of the same computer programs used to produce the thermodynamic

properties of oxygen given in NBS Report 9710A [1]; hence, the two sets of tables are completely compatible.

The nominal error in the tabulated values of DQ/DM is estimated to be about 2 percent. The value at the critical point is finite and interpolation in the critical region should produce no large errors. Estimated uncertainties in  $L_v$  and the densities are 0.1 Btu/lb and 0.1 percent respectively.

Table I presents values of the various quantities on the saturation boundaries, and Table II gives values of density and DQ/DM on selected isobars.

---

#### REFERENCES

- [1] Weber, L. A., Thermodynamic and Related Properties of Oxygen from the Triple Point to 300 K at Pressures to 300 Atmospheres, Supplement A (British Units), NBS Report 9710A.

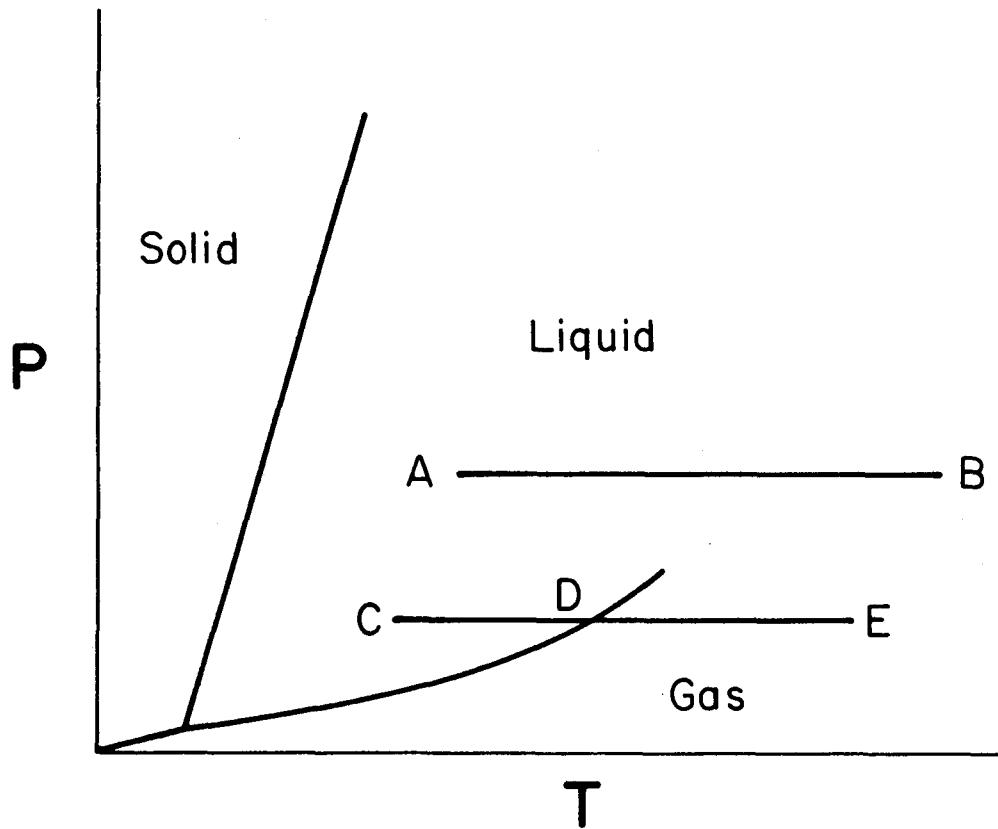


Figure 1. Typical pressure-temperature diagram  
of a fluid.

TABLE I. SATURATION PROPERTIES OF OXYGEN.

PRESSURE PSIA	TEMP DEG R	DENSITY LIQUID LB/CU FT	L <sub>v</sub> BTU/LB	DENSITY VAPOR LB/CU FT
10.000	155.986	72.3127	92.99	0.1962
14.696	162.324	71.2306	91.53	0.2794
20.000	167.816	70.2755	90.19	0.3710
30.000	175.684	68.8750	88.16	0.5395
40.000	181.763	67.7636	86.47	0.7046
50.000	186.792	66.8219	84.99	0.8678
60.000	191.123	65.9932	83.66	1.0299
70.000	194.948	65.2456	82.42	1.1913
80.000	198.392	64.5594	81.26	1.3525
90.000	201.533	63.9214	80.16	1.5137
100.000	204.428	63.3223	79.11	1.6751
150.000	216.384	60.7171	74.35	2.4918
200.000	225.720	58.4973	70.06	3.3343
250.000	233.499	56.4827	66.00	4.2139
300.000	240.230	54.5871	62.03	5.1414
350.000	246.196	52.7495	58.09	6.1290
400.000	251.575	50.9242	54.11	7.1926
450.000	256.485	49.0694	49.99	8.3542
500.000	261.007	47.1391	45.65	9.6471
550.000	265.199	45.0724	40.93	11.1273
600.000	269.107	42.7711	35.58	12.9042
650.000	272.762	40.0363	29.18	15.1620
700.000	276.191	36.2659	20.43	18.4703
720.000	277.504	33.8802	14.96	20.6798
730.000	278.149	31.9496	10.57	22.5241

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

10 PSIA ISOBAR

1 ATM ISOBAR (14.696 PSIA)

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 97.845	81.56977	213.4	• 97.852	81.57099	213.4
100	81.24189	212.0	100	81.24418	212.0
105	80.47782	208.7	105	80.48022	208.7
110	79.70899	205.4	110	79.71151	205.4
115	78.93495	202.0	115	78.93760	202.0
120	78.15519	198.6	120	78.15798	198.6
125	77.36915	195.1	125	77.37208	195.1
130	76.57619	191.5	130	76.57929	191.5
135	75.77562	187.9	135	75.77889	187.9
140	74.96665	184.2	140	74.97011	184.2
145	74.14840	180.4	145	74.15206	180.4
150	73.31985	176.5	150	73.32373	176.5
155	72.47987	172.5	155	72.48400	172.6
• 155.986	72.31273	171.7	160	71.63157	168.5
• 155.986	0.19616	32.7	• 162.324	71.23063	166.6
160	0.19087	33.7	• 162.324	0.27938	33.7
165	0.18469	34.8	165	0.27439	34.3
170	0.17893	36.0	170	0.26555	35.5
175	0.17353	37.1	175	0.25732	36.7
180	0.16846	38.2	180	0.24961	37.8
185	0.16369	39.4	185	0.24238	39.0
190	0.15919	40.5	190	0.23558	40.1
195	0.15495	41.6	195	0.22918	41.3
200	0.15093	42.7	200	0.22312	42.4
205	0.14712	43.9	205	0.21740	43.5
210	0.14350	45.0	210	0.21197	44.7
215	0.14007	46.1	215	0.20682	45.8
220	0.13679	47.2	220	0.20193	46.9
225	0.13367	48.3	225	0.19726	48.0
230	0.13070	49.4	230	0.19282	49.2
235	0.12785	50.5	235	0.18858	50.3
240	0.12513	51.6	240	0.18452	51.4
245	0.12252	52.7	245	0.18064	52.5
250	0.12003	53.8	250	0.17692	53.6
255	0.11763	54.9	255	0.17336	54.7
260	0.11533	56.0	260	0.16994	55.8
265	0.11312	57.1	265	0.16666	56.9
270	0.11099	58.3	270	0.16350	58.1
275	0.10894	59.4	275	0.16047	59.2
280	0.10697	60.5	280	0.15754	60.3
285	0.10507	61.5	285	0.15472	61.4
290	0.10323	62.6	290	0.15201	62.5
295	0.10146	63.7	295	0.14938	63.6
300	0.09975	64.8	300	0.14685	64.7
310	0.09650	67.0	310	0.14204	66.9
320	0.09346	69.2	320	0.13754	69.1
330	0.09060	71.4	330	0.13332	71.3
340	0.08791	73.6	340	0.12935	73.5
350	0.08538	75.8	350	0.12561	75.7
360	0.08300	78.0	360	0.12209	77.9
370	0.08074	80.2	370	0.11876	80.1
380	0.07860	82.4	380	0.11561	82.3
390	0.07657	84.6	390	0.11262	84.5
400	0.07465	86.8	400	0.10978	86.7
410	0.07282	89.0	410	0.10708	88.9
420	0.07108	91.2	420	0.10452	91.1
430	0.06942	93.5	430	0.10207	93.4
440	0.06784	95.7	440	0.09974	95.6
450	0.06632	97.9	450	0.09751	97.8
460	0.06488	100.1	460	0.09538	100.1
470	0.06349	102.4	470	0.09334	102.3
480	0.06216	104.6	480	0.09139	104.6
490	0.06089	106.9	490	0.08951	106.8
500	0.05967	109.2	500	0.08772	109.1
510	0.05850	111.4	510	0.08599	111.4
520	0.05737	113.7	520	0.08433	113.7
530	0.05628	116.0	530	0.08273	116.0
540	0.05524	118.3	540	0.08120	118.3

• TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

20 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DDDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DDDM BTU/LB
• 97.860	81.57238	213.4	* 97.874	81.57499	213.5
100	81.24677	212.0	100	81.25164	212.1
105	80.4894	208.8	105	80.48805	208.8
110	79.71436	205.4	110	79.71973	205.5
115	78.94059	202.1	115	78.94623	202.1
120	78.16113	198.6	120	78.16706	198.7
125	77.37540	195.1	125	77.38165	195.2
130	76.58278	191.6	130	76.58937	191.7
135	75.78258	188.0	135	75.78954	188.0
140	74.97401	184.3	140	74.98137	184.3
145	74.15619	180.5	145	74.16398	180.6
150	73.32812	176.6	150	73.33639	176.7
155	72.48867	172.6	155	72.49745	172.7
160	71.63654	168.6	160	71.64590	168.7
165	70.77026	164.4	165	70.78026	164.5
* 167.816	70.27551	162.0	170	69.89883	160.3
• 167.816	0.37098	34.5	175	68.99963	155.9
170	0.36659	35.0	* 175.684	68.87503	155.3
175	0.35387	36.2	* 175.684	0.53946	35.4
180	0.34296	37.4	180	0.52424	36.5
185	0.33276	38.5	185	0.50779	37.7
190	0.32319	39.7	190	0.49247	38.9
195	0.31420	40.9	195	0.47815	40.1
200	0.30574	42.0	200	0.46473	41.3
205	0.29774	43.2	205	0.45212	42.5
210	0.29018	44.3	210	0.44023	43.7
215	0.28301	45.5	215	0.42901	44.8
220	0.27621	46.6	220	0.41838	46.0
225	0.26974	47.7	225	0.40831	47.1
230	0.26358	48.9	230	0.39874	48.3
235	0.25770	50.0	235	0.38964	49.5
240	0.25210	51.1	240	0.38097	50.6
245	0.24674	52.2	245	0.37270	51.7
250	0.24161	53.4	250	0.36480	52.9
255	0.23670	54.5	255	0.35724	54.0
260	0.23198	55.6	260	0.35001	55.2
265	0.22746	56.7	265	0.34307	56.3
270	0.22312	57.8	270	0.33641	57.4
275	0.21894	58.9	275	0.33002	58.5
280	0.21492	60.1	280	0.32388	59.7
285	0.21105	61.2	285	0.31797	60.8
290	0.20732	62.3	290	0.31227	61.9
295	0.20372	63.4	295	0.30679	63.0
300	0.20025	64.5	300	0.30149	64.1
310	0.19365	66.7	310	0.29146	66.4
320	0.18748	68.9	320	0.28208	68.6
330	0.18170	71.1	330	0.27330	70.8
340	0.17627	73.3	340	0.26507	73.1
350	0.17116	75.5	350	0.25732	75.3
360	0.16634	77.8	360	0.25003	77.5
370	0.16178	80.0	370	0.24314	79.7
380	0.15747	82.2	380	0.23662	81.9
390	0.15339	84.4	390	0.23046	84.2
400	0.14952	86.6	400	0.22461	86.4
410	0.14584	88.8	410	0.21905	88.6
420	0.14233	91.0	420	0.21376	90.8
430	0.13900	93.3	430	0.20873	93.1
440	0.13581	95.5	440	0.20393	95.3
450	0.13277	97.7	450	0.19935	97.6
460	0.12986	100.0	460	0.19497	99.8
470	0.12708	102.2	470	0.19078	102.1
480	0.12442	104.5	480	0.18677	104.3
490	0.12187	106.7	490	0.18292	106.6
500	0.11942	109.0	500	0.17923	108.9
510	0.11706	111.3	510	0.17569	111.2
520	0.11480	113.6	520	0.17229	113.5
530	0.11262	115.9	530	0.16902	115.8
540	0.11053	118.2	540	0.16587	118.1

• TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

40 PSIA ISOBAR

50 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DDQM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DDQM BTU/LB
• 97.888	81.57760	213.5	• 97.903	81.58022	213.6
100	81.25652	212.2	100	81.26139	212.2
105	80.49316	208.9	105	80.49827	209.0
110	79.72509	205.6	110	79.73046	205.7
115	78.95187	202.2	115	78.95750	202.3
120	78.17299	198.8	120	78.17891	198.9
125	77.38789	195.3	125	77.39413	195.4
130	76.59595	191.8	130	76.60253	191.8
135	75.79649	188.1	135	75.80344	188.2
140	74.98872	184.4	140	74.99606	184.5
145	74.17177	180.7	145	74.17954	180.7
150	73.34464	176.8	150	73.35289	176.9
155	72.50623	172.8	155	72.51500	172.9
160	71.65525	168.8	160	71.66460	168.9
165	70.79025	164.7	165	70.80022	164.8
170	69.90952	160.4	170	69.92019	160.5
175	69.01111	156.0	175	69.02257	156.2
180	68.09273	151.5	180	68.10508	151.7
* 181.763	67.76364	149.9	185	67.16501	147.0
* 181.763	0.70461	36.0	• 186.702	66.82191	145.4
185	0.68948	36.8	• 186.702	0.86781	36.5
190	0.66757	38.1	190	0.84916	37.3
195	0.64723	39.3	195	0.82195	38.6
200	0.62827	40.6	200	0.79676	39.8
205	0.61054	41.8	205	0.77333	41.1
210	0.59390	43.0	210	0.75145	42.3
215	0.57825	44.2	215	0.73095	43.6
220	0.56349	45.4	220	0.71169	44.8
225	0.54953	46.6	225	0.69354	46.0
230	0.53631	47.7	230	0.67640	47.2
235	0.52377	48.9	235	0.66017	48.4
240	0.51184	50.1	240	0.64478	49.6
245	0.50049	51.2	245	0.63016	50.7
250	0.48966	52.4	250	0.61625	51.9
255	0.47932	53.6	255	0.60298	53.1
260	0.46944	54.7	260	0.59032	54.3
265	0.45998	55.8	265	0.57822	55.4
270	0.45091	57.0	270	0.56664	56.6
275	0.44221	58.1	275	0.55554	57.7
280	0.43386	59.3	280	0.54490	58.9
285	0.42583	60.4	285	0.53467	60.0
290	0.41811	61.5	290	0.52485	61.2
295	0.41067	62.7	295	0.51540	62.3
300	0.40351	63.8	300	0.50630	63.4
310	0.38993	66.0	310	0.48908	65.7
320	0.37726	68.3	320	0.47304	68.0
330	0.36542	70.5	330	0.45805	70.2
340	0.35432	72.8	340	0.44402	72.5
350	0.34389	75.0	350	0.43085	74.7
360	0.33407	77.2	360	0.41846	77.0
370	0.32480	79.5	370	0.40678	79.2
380	0.31605	81.7	380	0.39576	81.5
390	0.30777	83.9	390	0.38533	83.7
400	0.29991	86.2	400	0.37544	86.0
410	0.29246	88.4	410	0.36606	88.2
420	0.28537	90.7	420	0.35715	90.5
430	0.27862	92.9	430	0.34867	92.7
440	0.27219	95.1	440	0.34059	95.0
450	0.26605	97.4	450	0.33288	97.2
460	0.26019	99.6	460	0.32552	99.5
470	0.25458	101.9	470	0.31848	101.7
480	0.24921	104.2	480	0.31174	104.0
490	0.24406	106.4	490	0.30529	106.3
500	0.23913	108.7	500	0.29910	108.6
510	0.23439	111.0	510	0.29316	110.9
520	0.22984	113.3	520	0.28745	113.2
530	0.22546	115.6	530	0.28196	115.5
540	0.22125	117.9	540	0.27668	117.8

\* TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

60 PSIA ISOBAR

70 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
* 97.917	81.58283	213.6	* 97.931	81.58544	213.7
100	81.26626	212.3	100	81.27113	212.4
105	80.50338	209.0	105	80.50848	209.1
110	79.73582	205.7	110	79.74117	205.8
115	78.96313	202.4	115	78.96876	202.4
120	78.18483	198.9	120	78.19075	199.0
125	77.40036	195.5	125	77.40660	195.5
130	76.60911	191.9	130	76.61568	192.0
135	75.81038	188.3	135	75.81731	188.4
140	75.00340	184.6	140	75.01073	184.7
145	74.18731	180.8	145	74.19508	180.9
150	73.36114	177.0	150	73.36937	177.1
155	72.52376	173.1	155	72.53252	173.2
160	71.67393	169.0	160	71.68325	169.1
165	70.81018	164.9	165	70.82013	165.0
170	69.93086	160.6	170	69.94151	160.8
175	69.03402	156.3	175	69.04545	156.4
180	68.11741	151.8	180	68.12972	151.9
185	67.17834	147.2	185	67.19165	147.3
190	66.21363	142.4	190	66.22808	142.6
* 191.123	65.99315	141.3	* 194.948	65.24559	137.7
* 191.123	1.02986	36.8	* 194.948	1.19129	37.0
195	1.00292	37.8	195	1.19085	37.0
200	0.97067	39.1	200	1.15055	38.4
205	0.94086	40.4	205	1.11356	39.7
210	0.91317	41.7	210	1.07941	41.0
215	0.88735	42.9	215	1.04772	42.3
220	0.86319	44.2	220	1.01820	43.6
225	0.84050	45.4	225	0.99058	44.8
230	0.81914	46.6	230	0.96467	46.1
235	0.79897	47.8	235	0.94028	47.3
240	0.77989	49.1	240	0.91727	48.5
245	0.76181	50.3	245	0.89550	49.8
250	0.74463	51.4	250	0.87487	51.0
255	0.72828	52.6	255	0.85528	52.2
260	0.71271	53.8	260	0.83664	53.4
265	0.69784	55.0	265	0.81888	54.6
270	0.68363	56.2	270	0.80193	55.7
275	0.67004	57.3	275	0.78573	56.9
280	0.65701	58.5	280	0.77022	58.1
285	0.64451	59.6	285	0.75537	59.3
290	0.63252	60.8	290	0.74112	60.4
295	0.62099	62.0	295	0.72744	61.6
300	0.60989	63.1	300	0.71429	62.8
310	0.58892	65.4	310	0.68946	65.1
320	0.56941	67.7	320	0.66639	67.4
330	0.55121	69.9	330	0.64489	69.7
340	0.53418	72.2	340	0.62481	71.9
350	0.51822	74.5	350	0.60599	74.2
360	0.50321	76.7	360	0.58832	76.5
370	0.48908	79.0	370	0.57169	78.8
380	0.47574	81.2	380	0.55601	81.0
390	0.46313	83.5	390	0.54119	83.3
400	0.45119	85.8	400	0.52717	85.5
410	0.43987	88.0	410	0.51387	87.8
420	0.42911	90.3	420	0.50125	90.1
430	0.41888	92.5	430	0.48925	92.3
440	0.40913	94.8	440	0.47782	94.6
450	0.39984	97.0	450	0.46692	96.9
460	0.39096	99.3	460	0.45652	99.2
470	0.38248	101.6	470	0.44659	101.4
480	0.37437	103.9	480	0.43708	103.7
490	0.36659	106.2	490	0.42798	106.0
500	0.35914	108.5	500	0.41925	108.3
510	0.35199	110.8	510	0.41088	110.6
520	0.34512	113.1	520	0.40285	112.9
530	0.33851	115.4	530	0.39512	115.3
540	0.33216	117.7	540	0.38769	117.6

• TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

## 80 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 97.945	81.58805	213.7
100	81.27599	212.4
105	80.51358	209.2
110	79.74653	205.9
115	78.97439	202.5
120	78.19667	199.1
125	77.41282	195.6
130	76.62224	192.1
135	75.82424	188.5
140	75.01806	184.8
145	74.20284	181.0
150	73.37760	177.2
155	72.54126	173.3
160	71.69256	169.2
165	70.83007	165.1
170	69.95215	160.9
175	69.05687	156.5
180	68.14201	152.1
185	67.20494	147.5
190	66.24251	142.7
195	65.25094	137.8
• 198.392	64.55943	134.4
* 198.392	1.35247	37.2
200	1.33704	37.6
205	1.29192	39.0
210	1.25053	40.3
215	1.21236	41.7
220	1.17696	43.0
225	1.14398	44.2
230	1.11315	45.5
235	1.08423	46.8
240	1.05702	48.0
245	1.03134	49.3
250	1.00705	50.5
255	0.98404	51.7
260	0.96218	52.9
265	0.94138	54.1
270	0.92156	55.3
275	0.90265	56.5
280	0.88457	57.7
285	0.86727	58.9
290	0.85069	60.1
295	0.83479	61.2
300	0.81952	62.4
310	0.79071	64.7
320	0.76399	67.1
330	0.73912	69.4
340	0.71591	71.7
350	0.69418	74.0
360	0.67380	76.2
370	0.65463	78.5
380	0.63656	80.8
390	0.61950	83.1
400	0.60337	85.3
410	0.58808	87.6
420	0.57357	89.9
430	0.55977	92.2
440	0.54665	94.4
450	0.53414	96.7
460	0.52220	99.0
470	0.51080	101.3
480	0.49989	103.6
490	0.48945	105.9
500	0.47944	108.2
510	0.46985	110.5
520	0.46063	112.8
530	0.45178	115.1
540	0.44327	117.5

## 90 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 97.960	81.59066	213.8
100	81.28086	212.5
105	80.51868	209.2
110	79.75188	205.9
115	78.98001	202.6
120	78.20258	199.2
125	77.41905	195.7
130	76.62880	192.2
135	75.83117	188.6
140	75.02538	184.9
145	74.21059	181.1
150	73.38582	177.3
155	72.55000	173.4
160	71.70186	169.3
165	70.84000	165.2
170	69.96277	161.0
175	69.06827	156.7
180	68.15429	152.2
185	67.21820	147.6
190	66.25690	142.9
195	65.29664	138.0
200	64.24281	132.9
• 201.533	63.92144	131.3
• 201.533	1.51368	37.3
205	1.47652	38.3
210	1.42700	39.7
215	1.38160	41.0
220	1.33974	42.3
225	1.30092	43.7
230	1.26476	45.0
235	1.23096	46.2
240	1.19925	47.5
245	1.16940	48.8
250	1.14125	50.0
255	1.11461	51.3
260	1.08937	52.5
265	1.06539	53.7
270	1.04258	54.9
275	1.02084	56.1
280	1.00008	57.3
285	0.98024	58.5
290	0.96125	59.7
295	0.94305	60.9
300	0.92558	62.1
310	0.89268	64.4
320	0.86221	66.7
330	0.83389	69.1
340	0.80748	71.4
350	0.78279	73.7
360	0.75964	76.0
370	0.73789	78.3
380	0.71740	80.6
390	0.69807	82.8
400	0.67979	85.1
410	0.66248	87.4
420	0.64606	89.7
430	0.63046	92.0
440	0.61562	94.3
450	0.60148	96.5
460	0.58799	98.8
470	0.57511	101.1
480	0.56279	103.4
490	0.55100	105.7
500	0.53971	108.0
510	0.52888	110.3
520	0.51848	112.7
530	0.50849	115.0
540	0.49889	117.3

\* TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

100 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 97.974	81.59326	213.8
100	81.28572	212.5
105	80.52378	209.3
110	79.75723	206.0
115	78.98563	202.7
120	78.20849	199.3
125	77.42527	195.8
130	76.63536	192.2
135	75.83809	188.6
140	75.03270	185.0
145	74.21833	181.2
150	73.39404	177.4
155	72.55872	173.5
160	71.71116	169.4
165	70.84992	165.3
170	69.97338	161.1
175	69.07965	156.8
180	68.16654	152.3
185	67.23144	147.7
190	66.27127	143.0
195	65.28230	138.1
200	64.26000	133.0
• 204.428	63.32227	128.4
• 204.428	1.67514	37.4
205	1.66804	37.5
210	1.60931	39.0
215	1.55585	40.4
220	1.50683	41.7
225	1.46162	43.1
230	1.41968	44.4
235	1.38062	45.7
240	1.34408	47.0
245	1.30980	48.3
250	1.27754	49.5
255	1.24708	50.8
260	1.21828	52.0
265	1.19096	53.3
270	1.16501	54.5
275	1.14032	55.7
280	1.11678	56.9
285	1.09430	58.1
290	1.07281	59.3
295	1.05223	60.5
300	1.03251	61.7
310	0.99539	64.1
320	0.96107	66.4
330	0.92921	68.8
340	0.89953	71.1
350	0.87181	73.4
360	0.84585	75.7
370	0.82147	78.0
380	0.79853	80.3
390	0.77689	82.6
400	0.75644	84.9
410	0.73709	87.2
420	0.71873	89.5
430	0.70131	91.8
440	0.68473	94.1
450	0.66894	96.4
460	0.65389	98.7
470	0.63952	101.0
480	0.62578	103.3
490	0.61264	105.6
500	0.60005	107.9
510	0.58797	110.2
520	0.57639	112.5
530	0.56526	114.9
540	0.55456	117.2

• TWO-PHASE BOUNDARY

150 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 98.045	81.60630	214.1
100	81.30999	212.9
105	80.54922	209.6
110	79.78393	206.4
115	79.01367	203.0
120	78.23798	199.6
125	77.45631	196.2
130	76.66808	192.7
135	75.87262	189.1
140	75.06919	185.4
145	74.25696	181.7
150	73.43500	177.9
155	72.60224	174.0
160	71.75747	170.0
165	70.89933	165.9
170	70.02623	161.7
175	69.13634	157.4
180	68.22754	153.0
185	67.29732	148.4
190	66.34271	143.7
195	65.36015	138.9
200	64.34532	133.9
205	63.29285	128.6
210	62.19601	123.2
215	61.04614	117.6
* 216.384	60.71712	115.9
* 216.384	2.49178	37.5
220	2.42095	38.6
225	2.33215	40.1
230	2.25211	41.6
235	2.17928	43.0
240	2.11252	44.4
245	2.05093	45.8
250	1.99380	47.2
255	1.94059	48.5
260	1.89081	49.8
265	1.84408	51.1
270	1.80009	52.4
275	1.75855	53.7
280	1.71924	55.0
285	1.68196	56.3
290	1.64652	57.5
295	1.61277	58.8
300	1.58059	60.0
310	1.52042	62.5
320	1.46522	64.9
330	1.41432	67.3
340	1.36719	69.7
350	1.32339	72.1
360	1.28255	74.5
370	1.24435	76.9
380	1.20853	79.2
390	1.17485	81.6
400	1.14312	83.9
410	1.11315	86.2
420	1.08481	88.6
430	1.05795	90.9
440	1.03245	93.2
450	1.00821	95.5
460	0.98513	97.9
470	0.96312	100.2
480	0.94212	102.5
490	0.92204	104.9
500	0.90283	107.2
510	0.88444	109.6
520	0.86680	111.9
530	0.84987	114.3
540	0.83361	116.6

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

200 PSIA ISOBAR

250 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 98.116	81.61932	214.4	• 98.187	81.63233	214.7
100	81.33422	213.2	100	81.35839	213.5
105	80.57461	210.0	105	80.59994	210.3
110	79.81057	206.7	110	79.83714	207.1
115	79.04165	203.4	115	79.06955	203.8
120	78.26739	200.0	120	78.29671	200.4
125	77.48726	196.6	125	77.51812	197.0
130	76.70069	193.1	130	76.73320	193.5
135	75.90703	189.5	135	75.94132	189.9
140	75.10555	185.9	140	75.14177	186.3
145	74.29544	182.1	145	74.33376	182.6
150	73.47578	178.4	150	73.51639	178.8
155	72.64554	174.5	155	72.68864	175.0
160	71.80355	170.5	160	71.84939	171.0
165	70.94847	166.4	165	70.99733	167.0
170	70.07876	162.3	170	70.13096	162.9
175	69.19265	158.0	175	69.24858	158.6
180	68.28808	153.6	180	68.34818	154.3
185	67.36265	149.1	185	67.42744	149.8
190	66.41349	144.4	190	66.48363	145.2
195	65.43720	139.6	195	65.51346	140.4
200	64.42963	134.7	200	64.51299	135.5
205	63.38573	129.5	205	63.47739	130.4
210	62.29912	124.2	210	62.40068	125.1
215	61.16169	118.6	215	61.27523	119.6
220	59.96281	112.7	220	60.09116	113.8
225	58.68811	106.5	225	58.83525	107.7
• 225.720	58.49728	105.6	230	57.48924	101.3
• 225.720	3.33430	37.2	• 233.499	56.48268	98.5
230	3.21178	38.6	• 233.499	4.21392	36.7
235	3.08515	40.2	235	4.15094	37.2
240	2.97256	41.8	240	3.96210	39.0
245	2.87124	43.3	245	3.79882	40.7
250	2.77919	44.7	250	3.65500	42.3
255	2.69490	46.2	255	3.52651	43.8
260	2.61722	47.6	260	3.41047	45.4
265	2.54523	49.0	265	3.30473	46.9
270	2.47819	50.4	270	3.20766	48.3
275	2.41553	51.7	275	3.11801	49.8
280	2.35673	53.1	280	3.03479	51.2
285	2.30138	54.4	285	2.95718	52.6
290	2.24915	55.7	290	2.88452	54.0
295	2.19972	57.0	295	2.81627	55.3
300	2.15284	58.3	300	2.75195	56.7
310	2.06586	60.9	310	2.63363	59.3
320	1.98674	63.4	320	2.52703	62.0
330	1.91433	65.9	330	2.43025	64.5
340	1.84770	68.4	340	2.34181	67.1
350	1.78611	70.9	350	2.26054	69.6
360	1.72896	73.3	360	2.18549	72.1
370	1.67572	75.7	370	2.11590	74.6
380	1.62599	78.1	380	2.05113	77.1
390	1.57938	80.5	390	1.99064	79.5
400	1.53559	82.9	400	1.93399	81.9
410	1.49436	85.3	410	1.88078	84.4
420	1.45544	87.7	420	1.83068	86.8
430	1.41864	90.0	430	1.78341	89.2
440	1.38377	92.4	440	1.73871	91.6
450	1.35068	94.7	450	1.69637	94.0
460	1.31922	97.1	460	1.65618	96.4
470	1.28928	99.5	470	1.61798	98.7
480	1.26073	101.8	480	1.58162	101.1
490	1.23348	104.2	490	1.54694	103.5
500	1.20744	106.6	500	1.51385	105.9
510	1.18252	108.9	510	1.48221	108.3
520	1.15866	111.3	520	1.45194	110.7
530	1.13577	113.7	530	1.42294	113.1
540	1.11380	116.1	540	1.39512	115.5

\* TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

## 300 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
* 98.259	81.64532	215.0
100	81.38250	213.9
105	80.62521	210.7
110	79.86364	207.4
115	79.09737	204.1
120	78.32595	200.8
125	77.54888	197.4
130	76.76561	193.9
135	75.97550	190.4
140	75.17786	186.7
145	74.37192	183.1
150	73.55681	179.3
155	72.73154	175.5
160	71.89500	171.6
165	71.04592	167.5
170	70.18285	163.4
175	69.30413	159.2
180	68.40784	154.9
185	67.49172	150.4
190	66.55313	145.9
195	65.58895	141.1
200	64.59540	136.3
205	63.56789	131.2
210	62.50075	126.0
215	61.38684	120.6
220	60.21694	114.9
225	58.97890	108.9
230	57.65607	102.6
235	56.22602	97.7
240	54.66310	90.1
• 240.230	54.58713	89.8
• 240.230	5.14137	36.1
245	4.88326	37.9
250	4.65608	39.7
255	4.46079	41.4
260	4.28953	43.1
265	4.13708	44.7
270	3.99976	46.3
275	3.87492	47.8
280	3.76055	49.3
285	3.65509	50.8
290	3.55733	52.2
295	3.46628	53.6
300	3.38112	55.0
310	3.22596	57.8
320	3.08767	60.5
330	2.96323	63.2
340	2.85035	65.8
350	2.74726	68.4
360	2.65259	71.0
370	2.56520	73.5
380	2.48419	76.0
390	2.40881	78.5
400	2.33843	81.0
410	2.27250	83.5
420	2.21059	85.9
430	2.15230	88.3
440	2.09730	90.8
450	2.04528	93.2
460	1.99600	95.6
470	1.94922	98.0
480	1.90475	100.5
490	1.86241	102.9
500	1.82203	105.3
510	1.78348	107.7
520	1.74662	110.1
530	1.71135	112.6
540	1.67754	115.0

## 350 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
* 98.330	81.65830	215.2
100	81.40657	214.2
105	80.65043	211.0
110	79.89008	207.8
115	79.12512	204.5
120	78.35511	201.1
125	77.57956	197.8
130	76.79790	194.3
135	76.00955	190.8
140	75.21381	187.2
145	74.40994	183.5
150	73.59707	179.8
155	72.77424	176.0
160	71.94038	172.1
165	71.09424	168.1
170	70.23443	164.0
175	69.35933	159.8
180	68.46706	155.5
185	67.55548	151.1
190	66.62203	146.6
195	65.66370	141.9
200	64.67690	137.1
205	63.65725	132.1
210	62.59940	126.9
215	61.49661	121.5
220	60.34030	115.9
225	59.11924	110.1
230	57.81826	103.9
235	56.41389	99.2
240	54.89146	91.8
245	53.19038	84.2
* 246.196	52.74952	82.4
* 246.196	6.12899	35.4
250	5.84708	37.0
255	5.54050	38.9
260	5.28414	40.8
265	5.06373	42.5
270	4.87042	44.2
275	4.69833	45.8
280	4.54335	47.4
285	4.40247	48.9
290	4.27342	50.5
295	4.15444	51.9
300	4.04416	53.4
310	3.84541	56.3
320	3.67043	59.1
330	3.51451	61.8
340	3.37420	64.5
350	3.24693	67.2
360	3.13071	69.8
370	3.02395	72.4
380	2.92541	75.0
390	2.83405	77.5
400	2.74902	80.1
410	2.66961	82.6
420	2.59522	85.1
430	2.52534	87.5
440	2.45953	90.0
450	2.39742	92.5
460	2.33866	94.9
470	2.28298	97.4
480	2.223012	99.8
490	2.17985	102.3
500	2.13197	104.7
510	2.08630	107.1
520	2.04268	109.6
530	2.00097	112.0
540	1.96103	114.5

\* TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

## 400 PSIA ISOBAR

## 450 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
* 98.401	81.67126	215.5	• 98.472	81.68421	215.8
100	81.43058	214.5	100	81.45454	214.8
105	80.67558	211.3	105	80.70068	211.7
110	79.91646	208.1	110	79.94277	208.5
115	79.15280	204.8	115	79.18041	205.2
120	78.38419	201.5	120	78.41319	201.9
125	77.61014	198.1	125	77.64063	198.5
130	76.83010	194.7	130	76.86219	195.1
135	76.04349	191.2	135	76.07731	191.6
140	75.24964	187.6	140	75.28533	188.1
145	74.44780	184.0	145	74.48551	184.5
150	73.63715	180.3	150	73.67706	180.8
155	72.81674	176.5	155	72.85905	177.0
160	71.98553	172.6	160	72.03045	173.1
165	71.14230	168.6	165	71.19010	169.2
170	70.28570	164.6	170	70.33667	165.2
175	69.41416	160.4	175	69.46864	161.0
180	68.52587	156.2	180	68.58426	156.8
185	67.61874	151.8	185	67.68151	152.4
190	66.69032	147.3	190	66.75803	148.0
195	65.73773	142.6	195	65.81105	143.4
200	64.75751	137.8	200	64.83726	138.6
205	63.74552	132.9	205	63.83272	133.7
210	62.69666	127.8	210	62.79259	128.7
215	61.60461	122.5	215	61.71092	123.4
220	60.46135	117.0	220	60.58019	118.0
225	59.25648	111.2	225	59.39077	112.3
230	57.97612	105.1	230	58.12993	106.4
235	56.59577	100.5	235	56.77251	101.7
240	55.11032	93.4	240	55.32081	95.1
245	53.46175	86.1	245	53.71940	87.9
250	51.58348	77.9	250	51.91537	80.1
• 251.575	50.92418	75.1	255	49.79381	71.0
• 251.575	7.19257	34.7	• 256.485	49.06938	68.8
255	6.84895	36.2	• 256.485	8.35418	33.9
260	6.44581	38.3	260	7.87960	35.6
265	6.11879	40.2	265	7.36268	37.8
270	5.84334	42.1	270	6.95660	39.9
275	5.60535	43.8	275	6.62146	41.8
280	5.39588	45.5	280	6.33598	43.6
285	5.20892	47.1	285	6.08738	45.3
290	5.04020	48.7	290	5.86730	47.0
295	4.88658	50.3	295	5.67001	48.6
300	4.74568	51.8	300	5.49133	50.2
310	4.49499	54.8	310	5.17820	53.3
320	4.27732	57.7	320	4.91061	56.3
330	4.08546	60.5	330	4.67760	59.3
340	3.91432	63.3	340	4.47175	62.1
350	3.76021	66.1	350	4.28782	64.9
360	3.62032	68.7	360	4.12193	67.7
370	3.49249	71.4	370	3.97117	70.4
380	3.37502	74.0	380	3.83325	73.1
390	3.26652	76.6	390	3.70638	75.7
400	3.16587	79.2	400	3.58911	78.3
410	3.07216	81.7	410	3.48023	80.9
420	2.98460	84.3	420	3.37879	83.5
430	2.90254	86.8	430	3.28394	86.0
440	2.82543	89.3	440	3.19499	88.6
450	2.75277	91.8	450	3.11134	91.1
460	2.68417	94.2	460	3.03249	93.6
470	2.61925	96.7	470	2.95800	96.1
480	2.55770	99.2	480	2.88746	98.6
490	2.49924	101.6	490	2.82056	101.1
500	2.44363	104.1	500	2.75698	103.5
510	2.39064	106.6	510	2.69647	106.0
520	2.34008	109.0	520	2.63879	108.5
530	2.29177	111.5	530	2.58373	111.0
540	2.24556	114.0	540	2.53110	113.5

• TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

500 PSIA ISOBAR

550 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 98.543	81.69715	216.1	• 98.614	81.71007	216.3
100	81.47845	215.1	100	81.50231	215.5
105	80.72572	212.0	105	80.75070	212.3
110	79.96901	208.8	110	79.99520	209.2
115	79.20795	205.6	115	79.23542	205.9
120	78.44211	202.3	120	78.47095	202.6
125	77.67103	198.9	125	77.70134	199.3
130	76.89419	195.5	130	76.92608	195.9
135	76.11102	192.0	135	76.14461	192.5
140	75.32089	188.5	140	75.35632	188.9
145	74.52308	184.9	145	74.56050	185.4
150	73.71680	181.2	150	73.75638	181.7
155	72.90116	177.5	155	72.94309	178.0
160	72.07516	173.6	160	72.11964	174.2
165	71.23765	169.7	165	71.28494	170.3
170	70.38735	165.7	170	70.43773	166.3
175	69.52277	161.6	175	69.57657	162.2
180	68.64224	157.4	180	68.69982	158.0
185	67.79380	153.1	185	67.80561	153.7
190	66.82516	148.7	190	66.89173	149.3
195	65.88367	144.1	195	65.95563	144.8
200	64.91617	139.4	200	64.99427	140.2
205	63.91889	134.6	205	64.00405	135.4
210	62.88723	129.5	210	62.98063	130.4
215	61.81559	124.4	215	61.91869	125.3
220	60.69692	119.0	220	60.81164	120.0
225	59.52227	113.4	225	59.65112	114.5
230	58.27993	107.6	230	58.42637	108.7
235	56.94442	102.9	235	57.11181	104.2
240	55.52283	96.5	240	55.71816	97.9
245	53.96503	89.6	245	54.20001	91.2
250	52.22622	82.1	250	52.51900	84.0
255	50.21665	73.6	255	50.60283	76.0
260	47.73173	64.2	260	48.29930	67.2
• 261.007	47.13914	62.1	265	45.22519	55.7
• 261.007	9.64714	33.1	• 265.199	45.07242	55.6
265	8.92314	35.2	• 265.199	11.12734	32.3
270	8.27840	37.6	270	9.95601	35.1
275	7.78763	39.7	275	9.17729	37.5
280	7.39018	41.7	280	8.60071	39.7
285	7.05594	43.5	285	8.14114	41.7
290	6.76757	45.3	290	7.75869	43.6
295	6.51410	47.0	295	7.43121	45.4
300	6.28816	48.7	300	7.14503	47.2
310	5.89922	51.9	310	6.66300	50.5
320	5.57291	55.0	320	6.26717	53.7
330	5.29261	58.0	330	5.93234	56.8
340	5.04759	61.0	340	5.64304	59.8
350	4.83049	63.8	350	5.38903	62.8
360	4.63604	66.6	360	5.16317	65.6
370	4.46032	69.4	370	4.96030	68.5
380	4.30035	72.1	380	4.77654	71.2
390	4.15380	74.8	390	4.60892	74.0
400	4.01881	77.5	400	4.45509	76.7
410	3.89389	80.1	410	4.31318	79.3
420	3.77780	82.7	420	4.18168	82.0
430	3.66953	85.3	430	4.05932	84.6
440	3.56820	87.9	440	3.94507	87.2
450	3.47311	90.4	450	3.83806	89.8
460	3.38362	92.9	460	3.73752	92.3
470	3.29920	95.5	470	3.64283	94.9
480	3.21939	98.0	480	3.55343	97.4
490	3.14377	100.5	490	3.46885	99.9
500	3.07201	103.0	500	3.38866	102.5
510	3.00377	105.5	510	3.31250	105.0
520	2.93879	108.0	520	3.24003	107.5
530	2.87681	110.5	530	3.17099	110.0
540	2.81763	113.0	540	3.10510	112.5

• TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

## 600 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DODM BTU/LB
• 98.684	81.72298	216.6
100	81.52612	215.8
105	80.77563	212.7
110	80.02132	209.5
115	79.26281	206.3
120	78.49971	203.0
125	77.73156	199.7
130	76.95787	196.3
135	76.17810	192.9
140	75.39162	189.4
145	74.59777	185.8
150	73.79579	182.2
155	72.98482	178.5
160	72.16391	174.7
165	71.33198	170.8
170	70.48782	166.9
175	69.63002	162.8
180	68.75701	158.6
185	67.86696	154.4
190	66.95775	150.0
195	66.02692	145.5
200	65.07157	140.9
205	64.08825	136.2
210	63.07283	131.3
215	62.02029	126.2
220	60.92443	121.0
225	59.77746	115.5
230	58.56943	109.9
235	57.27493	105.4
240	55.90733	99.3
245	54.42548	92.8
250	52.79609	85.8
255	50.95982	78.2
260	48.80112	70.0
265	46.06318	59.8
• 269.107	42.77107	49.3
• 269.107	12.90419	31.5
270	12.46534	32.2
275	10.94825	35.2
280	10.04207	37.7
285	9.38439	39.9
290	8.86608	41.9
295	8.43797	43.8
300	8.07339	45.7
310	7.47550	49.1
320	6.99678	52.5
330	6.59885	55.6
340	6.25939	58.7
350	5.96425	61.7
360	5.70387	64.7
370	5.47146	67.5
380	5.26205	70.4
390	5.07188	73.1
400	4.89801	75.9
410	4.73815	78.6
420	4.59442	81.3
430	4.45332	83.9
440	4.32558	86.5
450	4.20616	89.1
460	4.09417	91.7
470	3.98886	94.3
480	3.88957	96.9
490	3.79575	99.4
500	3.70690	102.0
510	3.62261	104.5
520	3.54249	107.0
530	3.46621	109.6
540	3.39348	112.1

## 650 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DODM BTU/LB
* 98.755	81.73587	216.9
100	81.54987	216.1
105	80.80050	213.0
110	80.04738	209.8
115	79.29014	206.6
120	78.52839	203.4
125	77.76169	200.1
130	76.98956	196.7
135	76.21147	193.3
140	75.42680	189.8
145	74.63491	186.3
150	73.83504	182.7
155	73.02637	179.0
160	72.20797	175.2
165	71.37878	171.3
170	70.53763	167.4
175	69.68315	163.4
180	68.81382	159.3
185	67.92786	155.0
190	67.02323	150.7
195	66.09757	146.3
200	65.14809	141.7
205	64.17150	137.0
210	63.16386	132.1
215	62.12043	127.1
220	61.03536	121.9
225	59.90140	116.6
230	58.70932	111.0
235	57.43403	106.5
240	56.09081	100.6
245	54.64237	94.3
250	53.05948	87.6
255	51.29273	80.4
260	49.25186	72.6
265	46.75227	63.2
270	43.28110	51.4
• 272.762	40.03633	43.1
• 272.762	15.16196	30.8
275	13.58320	32.8
280	11.86901	35.6
285	10.85635	38.0
290	10.12818	40.2
295	9.55761	42.3
300	9.08827	44.2
310	8.34392	47.8
320	7.76563	51.2
330	7.29437	54.5
340	6.89799	57.7
350	6.55700	60.7
360	6.25866	63.7
370	5.99414	66.6
380	5.75710	69.5
390	5.54281	72.3
400	5.34767	75.1
410	5.16883	77.9
420	5.00405	80.6
430	4.85151	83.3
440	4.70971	85.9
450	4.57740	88.5
460	4.45354	91.2
470	4.33724	93.8
480	4.22776	96.3
490	4.12443	98.9
500	4.02670	101.5
510	3.93408	104.0
520	3.84612	106.6
530	3.76246	109.1
540	3.68274	111.7

• TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

700 PSIA ISOBAR

730 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 98.826	81.74875	217.2	• 98.869	81.75647	217.3
100	81.57358	216.4	100	81.58778	216.6
105	80.82532	213.3	105	80.84018	213.5
110	80.07337	210.2	110	80.08894	210.4
115	79.31739	207.0	115	79.33371	207.2
120	78.55699	203.8	120	78.57412	204.0
125	77.79174	200.5	125	77.80973	200.7
130	77.02116	197.1	130	77.04007	197.4
135	76.24473	193.7	135	76.26463	194.0
140	75.46185	190.3	140	75.48283	190.5
145	74.67190	186.7	145	74.69402	187.0
150	73.87413	183.1	150	73.89750	183.4
155	73.06774	179.5	155	73.09247	179.7
160	72.25181	175.7	160	72.27802	176.0
165	71.42534	171.9	165	71.45316	172.2
170	70.58715	168.0	170	70.61674	168.3
175	69.73595	164.0	175	69.76748	164.3
180	68.87024	159.9	180	68.90391	160.2
185	67.98831	155.7	185	68.02437	156.1
190	67.08819	151.4	190	67.12691	151.8
195	66.16759	147.0	195	66.20931	147.4
200	65.22385	142.4	200	65.26896	142.9
205	64.25383	137.8	205	64.30280	138.2
210	63.25377	132.9	210	63.30718	133.4
215	62.21917	128.0	215	62.27775	128.5
220	61.14453	122.9	220	61.20920	123.4
225	60.02305	117.6	225	60.09499	118.2
230	58.84620	112.1	230	58.92695	112.8
235	57.58934	107.7	235	57.68078	108.4
240	56.26902	101.9	240	56.37357	102.6
245	54.85147	95.8	245	54.97348	96.6
250	53.31080	89.2	250	53.45636	90.2
255	51.60523	82.3	255	51.78418	83.5
260	49.66295	74.9	260	49.89390	76.2
265	47.34537	66.2	265	47.66704	67.8
270	44.34568	55.9	270	44.86691	58.3
275	39.15638	42.0	275	40.58667	46.3
• 276.191	36.26587	36.6	245	54.97348	96.6
• 276.191	18.47029	30.7	• 278.149	31.94964	32.3
280	14.49204	33.6	• 278.149	22.52406	30.2
285	12.69456	36.2	280	17.10614	32.5
290	11.60729	38.6	285	14.07942	35.2
295	10.82377	40.8	290	12.64157	37.7
300	10.20985	42.8	295	11.67397	39.9
310	9.27705	46.5	300	10.94514	42.0
320	8.57817	50.1	310	9.87235	45.8
330	8.02136	53.4	320	9.08873	49.4
340	7.56028	56.6	330	8.47376	52.8
350	7.16816	59.8	340	7.96966	56.1
360	6.82808	62.8	350	7.54406	59.2
370	6.52866	65.8	360	7.17698	62.3
380	6.26188	68.7	370	6.85520	65.3
390	6.02184	71.6	380	6.56949	68.3
400	5.80410	74.4	390	6.31317	71.1
410	5.60525	77.2	400	6.08124	74.0
420	5.42257	79.9	410	5.86986	76.8
430	5.25388	82.6	420	5.67601	79.5
440	5.09742	85.3	430	5.49729	82.3
450	4.95172	88.0	440	5.33175	85.0
460	4.81558	90.6	450	5.17779	87.6
470	4.68794	93.2	460	5.03406	90.3
480	4.56796	95.8	470	4.89946	92.9
490	4.45486	98.4	480	4.77302	95.5
500	4.34802	101.0	490	4.65394	98.1
510	4.24686	103.6	500	4.54151	100.7
520	4.15089	106.1	510	4.43514	103.3
530	4.05968	108.7	520	4.33428	105.9
540	3.97285	111.2	530	4.23847	108.4
			540	4.14731	111.0

• TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

740 PSIA ISOBAR

750 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DDQM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DDQM BTU/LB
• 98.883	81.75904	217.4	• 98.897	81.76162	217.4
100	81.59251	216.7	100	81.59724	216.8
105	80.84513	213.6	105	80.85007	213.7
110	80.09412	210.5	110	80.09931	210.5
115	79.33915	207.3	115	79.34458	207.4
120	78.57982	204.1	120	78.58552	204.1
125	77.81571	200.8	125	77.82170	200.9
130	77.04637	197.4	130	77.05266	197.5
135	76.27125	194.1	135	76.27788	194.1
140	75.48981	190.6	140	75.49678	190.7
145	74.70139	187.1	145	74.70875	187.2
150	73.90528	183.5	150	73.91305	183.6
155	73.10070	179.8	155	73.10892	179.9
160	72.28674	176.1	160	72.29545	176.2
165	71.46241	172.3	165	71.47165	172.4
170	70.62658	168.4	170	70.63641	168.5
175	69.77796	164.4	175	69.78843	164.6
180	68.91511	160.4	180	68.92629	160.5
185	68.03635	156.2	185	68.04832	156.3
190	67.13978	151.9	190	67.15262	152.0
195	66.22317	147.5	195	66.23700	147.7
200	65.28394	143.0	200	65.29888	143.2
205	64.31905	138.4	205	64.33527	138.5
210	63.32490	133.6	210	63.34258	133.8
215	62.29718	128.7	215	62.31655	128.9
220	61.23063	123.6	220	61.25198	123.8
225	60.11880	118.4	225	60.14253	118.6
230	58.95365	113.0	230	58.98023	113.2
235	57.71099	108.6	235	57.74105	108.8
240	56.40804	102.9	240	56.44233	103.1
245	55.01361	96.9	245	55.05347	97.2
250	53.50406	90.5	250	53.55137	90.8
255	51.84252	83.8	255	51.90024	84.2
260	49.96857	76.6	260	50.04215	77.0
265	47.76950	68.4	265	47.86979	68.9
270	45.02691	59.0	270	45.18106	59.7
275	40.95135	47.5	275	41.28167	48.6
280	16.50569	32.3	280	20.71596	31.5
285	14.61473	34.8	285	15.19881	34.5
290	13.01835	37.4	290	13.41363	37.0
295	11.97561	39.6	295	12.28747	39.3
300	11.20224	41.7	300	11.46586	41.4
310	10.07726	45.6	310	10.28559	45.3
320	9.26302	49.2	320	9.43943	49.0
330	8.62740	52.6	330	8.78249	52.4
340	8.10819	55.9	340	8.24778	55.7
350	7.67093	59.0	350	7.79861	58.9
360	7.29451	62.1	360	7.41267	62.0
370	6.96503	65.2	370	7.07536	65.0
380	6.67283	68.1	380	6.77657	68.0
390	6.41095	71.0	390	6.50905	70.9
400	6.17417	73.9	400	6.26737	73.7
410	5.95852	76.7	410	6.04742	76.5
420	5.76088	79.4	420	5.84595	79.3
430	5.57876	82.2	430	5.66040	82.0
440	5.41015	84.9	440	5.48868	84.7
450	5.25339	87.5	450	5.32910	87.4
460	5.10710	90.2	460	5.18024	90.1
470	4.97014	92.8	470	5.04092	92.7
480	4.84153	95.4	480	4.91012	95.3
490	4.72043	98.0	490	4.78699	98.0
500	4.60613	100.6	500	4.67080	100.5
510	4.49800	103.2	510	4.56091	103.1
520	4.39549	105.8	520	4.45675	105.7
530	4.29814	108.4	530	4.35785	108.3
540	4.20552	110.9	540	4.26377	110.8

• TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

800 PSIA ISOBAR

850 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 98.968	81.77447	217.7	• 99.038	81.78731	218.0
100	81.62084	217.1	100	81.64440	217.4
105	80.87478	214.0	105	80.89943	214.3
110	80.12518	210.9	110	80.15099	211.2
115	79.37170	207.7	115	79.39875	208.1
120	78.61397	204.5	120	78.64234	204.9
125	77.85157	201.2	125	77.88136	201.6
130	77.08406	197.9	130	77.11536	198.3
135	76.31092	194.6	135	76.34385	195.0
140	75.53159	191.1	140	75.56628	191.6
145	74.74546	187.6	145	74.78203	188.1
150	73.95183	184.1	150	73.99044	184.5
155	73.14992	180.4	155	73.19075	180.9
160	72.33888	176.7	160	72.38211	177.2
165	71.51773	172.9	165	71.56358	173.5
170	70.68538	169.1	170	70.73410	169.6
175	69.84060	165.1	175	69.89246	165.7
180	68.98197	161.1	180	69.03730	161.7
185	68.10790	157.0	185	68.16707	157.6
190	67.21656	152.7	190	67.27999	153.4
195	66.30581	148.4	195	66.37403	149.1
200	65.37320	143.9	200	65.44681	144.6
205	64.41584	139.3	205	64.49557	140.1
210	63.43033	134.6	210	63.51706	135.4
215	62.41262	129.7	215	62.50743	130.6
220	61.35781	124.7	220	61.46205	125.7
225	60.25991	119.6	225	60.37531	120.6
230	59.11156	114.3	230	59.24031	115.3
235	57.88936	110.0	235	58.03445	111.1
240	56.61105	104.4	240	56.77547	105.6
245	55.24894	98.6	245	55.43840	99.9
250	53.78227	92.4	250	54.00443	93.9
255	52.18007	86.0	255	52.44654	87.7
260	50.39502	79.1	260	50.72568	81.0
265	48.34208	71.4	265	48.77323	73.8
270	45.87927	63.0	270	46.48452	65.9
275	42.60090	53.3	275	43.59506	57.2
280	36.86004	40.0	280	39.39955	46.4
285	19.44751	32.9	285	29.41649	34.1
290	15.75484	35.5	290	19.11606	34.4
295	14.03133	38.1	295	16.18338	37.0
300	12.89513	40.2	300	14.55819	39.0
310	11.38261	44.2	310	12.58378	43.2
320	10.35513	47.9	320	11.33158	46.9
330	9.58062	51.4	330	10.41875	50.5
340	8.96202	54.8	340	9.70456	53.9
350	8.44922	58.0	350	9.12084	57.2
360	8.01293	61.1	360	8.62932	60.4
370	7.63450	64.2	370	8.20636	63.5
380	7.30134	67.2	380	7.83632	66.5
390	7.00452	70.2	390	7.50833	69.5
400	6.73750	73.1	400	7.21450	72.4
410	6.49533	75.9	410	6.94896	75.3
420	6.27418	78.7	420	6.70721	78.1
430	6.07103	81.5	430	6.48572	80.9
440	5.88345	84.2	440	6.28168	83.7
450	5.70949	86.9	450	6.09281	86.4
460	5.54749	89.6	460	5.91726	89.1
470	5.39611	92.2	470	5.75346	91.8
480	5.25419	94.9	480	5.60012	94.4
490	5.12077	97.5	490	5.45614	97.1
500	4.99500	100.1	500	5.32058	99.7
510	4.87618	102.7	510	5.19263	102.3
520	4.76366	105.3	520	5.07159	104.9
530	4.65691	107.9	530	4.95684	107.5
540	4.55545	110.5	540	4.84786	110.1

• TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

900 PSIA ISOBAR

950 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DDDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DDDM BTU/LB
* 99.109	81.80014	218.3	* 99.180	81.81295	218.5
100	81.66791	217.7	100	81.69137	218.0
105	80.92402	214.7	105	80.94856	215.0
110	80.17674	211.6	110	80.20243	211.9
115	79.42573	208.4	115	79.45265	208.8
120	78.67064	205.3	120	78.69886	205.6
125	77.91107	202.0	125	77.94069	202.4
130	77.14657	198.7	130	77.17769	199.1
135	76.37668	195.4	135	76.40940	195.8
140	75.60084	192.0	140	75.63528	192.4
145	74.81847	188.5	145	74.85477	189.0
150	74.02890	185.0	150	74.06720	185.5
155	73.23140	181.4	155	73.27187	181.9
160	72.42514	177.7	160	72.46796	178.2
165	71.60920	174.0	165	71.65459	174.5
170	70.78254	170.2	170	70.83073	170.7
175	69.94401	166.3	175	69.99525	166.9
180	69.09226	162.3	180	69.14688	162.9
185	68.22581	158.2	185	68.28415	158.8
190	67.34294	154.0	190	67.40541	154.7
195	66.44167	149.8	195	66.50875	150.4
200	65.51973	145.4	200	65.59199	146.1
205	64.57447	140.9	205	64.65257	141.6
210	63.60279	136.2	210	63.68755	137.0
215	62.60102	131.5	215	62.69342	132.3
220	61.56477	126.6	220	61.66604	127.5
225	60.48879	121.5	225	60.60043	122.5
230	59.36661	116.3	230	59.49057	117.4
235	58.17646	112.1	235	58.31555	113.2
240	56.93587	106.8	240	57.09247	108.0
245	55.62229	101.2	245	55.80100	102.5
250	54.21863	95.4	250	54.42556	96.8
255	52.70114	89.3	255	52.94512	90.9
260	51.03730	82.9	260	51.33238	84.6
265	49.17092	76.0	265	49.54079	78.1
270	47.02186	68.5	270	47.50706	71.0
275	44.40603	60.5	275	45.09733	63.5
280	40.93141	51.1	280	42.06405	55.0
285	35.22676	40.7	285	37.77091	46.0
290	24.45112	34.5	290	30.44380	37.5
295	18.96747	36.1	295	22.64969	36.0
300	16.52468	38.1	300	18.89695	37.5
310	13.91486	42.2	310	15.38837	41.4
320	12.37552	46.1	320	13.49818	45.3
330	11.29990	49.7	330	12.22700	48.9
340	10.47692	53.1	340	11.28049	52.4
350	9.81427	56.4	350	10.53021	55.7
360	9.26228	59.7	360	9.91215	59.0
370	8.79115	62.8	370	9.38903	62.2
380	8.38161	65.9	380	8.93726	65.3
390	8.02048	68.9	390	8.54097	68.3
400	7.69835	71.8	400	8.18902	71.3
410	7.40828	74.7	410	7.87323	74.2
420	7.14500	77.6	420	7.58748	77.1
430	6.90442	80.4	430	7.32705	79.9
440	6.68330	83.2	440	7.08824	82.7
450	6.47903	85.9	450	6.86806	85.5
460	6.28949	88.7	460	6.66412	88.2
470	6.11292	91.3	470	6.47443	90.9
480	5.94786	94.0	480	6.29734	93.6
490	5.79306	96.7	490	6.13147	96.3
500	5.64748	99.3	500	5.97565	98.9
510	5.51021	101.9	510	5.82887	101.6
520	5.38047	104.5	520	5.69027	104.2
530	5.25758	107.1	530	5.55909	106.8
540	5.14096	109.7	540	5.43470	109.4

• TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

1000 PSIA ISOBAR

1100 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 99.250	81.82575	218.8	• 99.393	81.85109	219.4
100	81.71478	218.4	100	81.76146	219.0
105	80.97305	215.3	105	81.02186	216.0
110	80.22806	212.3	110	80.27914	212.9
115	79.47949	209.1	115	79.53299	209.9
120	78.72701	206.0	120	78.78308	206.7
125	77.97022	202.8	125	78.02905	203.5
130	77.20871	199.5	130	77.27048	200.3
135	76.44201	196.2	135	76.50693	197.0
140	75.66961	192.8	140	75.73791	193.7
145	74.89094	189.4	145	74.96288	190.3
150	74.10536	185.9	150	74.18122	186.9
155	73.31217	182.4	155	73.39227	183.3
160	72.51060	178.8	160	72.59528	179.8
165	71.69975	175.1	165	71.78942	176.1
170	70.87866	171.3	170	70.97376	172.4
175	70.04621	167.4	175	70.14724	168.6
180	69.20116	163.5	180	69.30870	164.7
185	68.34209	159.5	185	68.45680	160.7
190	67.46741	155.3	190	67.59005	156.6
195	66.57528	151.1	195	66.70674	152.5
200	65.66359	146.8	200	65.80489	148.2
205	64.72990	142.4	205	64.88227	143.8
210	63.77137	137.8	210	63.93628	139.4
215	62.78467	133.1	215	62.96389	134.8
220	61.76589	128.3	220	61.96154	130.1
225	60.71031	123.4	225	60.92506	125.3
230	59.61230	118.4	230	59.84946	120.3
235	58.45185	114.3	235	58.71662	116.4
240	57.24548	109.1	240	57.54152	111.4
245	55.97489	103.7	245	56.30937	106.1
250	54.62580	98.1	250	55.00817	100.8
255	53.17950	92.4	255	53.62290	95.3
260	51.61292	86.3	260	52.13666	89.5
265	49.88709	80.0	265	50.52155	83.7
270	47.95075	73.3	270	48.74186	77.4
275	45.70347	66.2	275	46.73729	71.0
280	42.97600	58.4	280	44.41604	64.2
285	39.41214	50.3	285	41.62946	57.2
290	34.16037	42.1	290	38.09348	50.2
295	26.96927	37.2	295	33.47913	43.4
300	21.74985	37.4	300	28.14366	40.0
310	17.02880	40.8	310	20.84863	40.5
320	14.70234	44.6	320	17.37859	43.7
330	13.20259	48.2	330	15.31608	47.2
340	12.11645	51.7	340	13.89042	50.6
350	11.26921	55.1	350	12.81756	54.0
360	10.57917	58.4	360	11.96506	57.3
370	10.00008	61.6	370	11.26168	60.5
380	9.50327	64.7	380	10.66614	63.7
390	9.05978	67.8	390	10.15194	66.8
400	8.68644	70.8	400	9.70113	69.8
410	8.34373	73.7	410	9.30097	72.8
420	8.03457	76.6	420	8.94216	75.7
430	7.75354	79.5	430	8.61769	78.6
440	7.49642	82.3	440	8.32213	81.5
450	7.25983	85.1	450	8.05123	84.3
460	7.04106	87.8	460	7.80159	87.1
470	6.83790	90.5	470	7.57046	89.8
480	6.64849	93.2	480	7.35555	92.5
490	6.47130	95.9	490	7.15498	95.2
500	6.30502	98.6	500	6.96717	97.9
510	6.14855	101.2	510	6.79078	100.6
520	6.00093	103.8	520	6.62465	103.2
530	5.86133	106.5	530	6.46780	105.9
540	5.72905	109.1	540	6.31937	108.5

\* TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

1200 PSIA ISOBAR

1300 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 99.533	81.87669	219.9	• 99.673	81.90220	220.5
100	81.80794	219.6	100	81.85424	220.3
105	81.07046	216.7	105	81.11885	217.3
110	80.32998	213.6	110	80.38060	214.3
115	79.58623	210.6	115	79.63920	211.3
120	78.83886	207.5	120	78.89435	208.2
125	78.08754	204.3	125	78.14572	205.1
130	77.33188	201.1	130	77.39292	201.9
135	76.57144	197.9	135	76.63554	198.7
140	75.80575	194.6	140	75.87314	195.4
145	75.03430	191.2	145	75.10521	192.1
150	74.25650	187.8	150	74.33119	188.7
155	73.47171	184.3	155	73.55049	185.2
160	72.67921	180.8	160	72.76241	181.7
165	71.87823	177.1	165	71.96620	178.2
170	71.06787	173.5	170	71.16102	174.5
175	70.24714	169.7	175	70.34594	170.8
180	69.41493	165.8	180	69.51990	167.0
185	68.57000	161.9	185	68.68172	163.1
190	67.71093	157.9	190	67.83009	159.2
195	66.83612	153.8	195	66.96351	155.1
200	65.94375	149.6	200	66.08028	151.0
205	65.03175	145.3	205	65.17847	146.8
210	64.09773	140.9	210	64.25589	142.4
215	63.13891	136.4	215	63.31000	138.0
220	62.15210	131.8	220	62.33789	133.5
225	61.13353	127.1	225	61.33617	128.8
230	60.07879	122.2	230	60.30090	124.1
235	58.97166	118.4	235	59.21780	120.4
240	57.82535	113.5	240	58.09811	115.6
245	56.62789	108.5	245	56.93217	110.7
250	55.36917	103.3	250	55.71150	105.8
255	54.03701	98.1	255	54.42615	100.7
260	52.61863	92.6	260	53.06609	95.4
265	51.09359	87.1	265	51.61615	90.3
270	49.43558	81.2	270	50.05622	84.7
275	47.60615	75.3	275	48.36075	79.1
280	45.54928	69.0	280	46.49334	73.3
285	43.18640	62.8	285	44.40407	67.6
290	40.38858	56.7	290	42.02678	62.1
295	37.01460	50.2	295	39.29136	56.1
300	33.00797	45.4	300	36.14333	51.2
310	25.15195	41.8	310	29.17953	44.9
320	20.39931	43.6	320	23.62951	44.6
330	17.63792	46.6	330	20.13706	46.7
340	15.80272	49.9	340	17.83954	49.6
350	14.46131	53.2	350	16.19451	52.7
360	13.41823	56.4	360	14.93866	55.9
370	12.57474	59.7	370	13.93737	59.1
380	11.86897	62.9	380	13.10924	62.2
390	11.26575	66.0	390	12.40913	65.3
400	10.74126	69.0	400	11.80509	68.4
410	10.27892	72.0	410	11.27609	71.4
420	9.86678	75.0	420	10.80711	74.4
430	9.49593	77.9	430	10.38712	77.3
440	9.15958	80.8	440	10.00777	80.2
450	8.85246	83.6	450	9.66262	83.1
460	8.57037	86.4	460	9.34660	85.9
470	8.30995	89.2	470	9.05566	88.7
480	8.06844	91.9	480	8.78651	91.4
490	7.84356	94.6	490	8.53646	94.1
500	7.63343	97.3	500	8.30325	96.8
510	7.43642	100.0	510	8.08501	99.5
520	7.25120	102.7	520	7.88015	102.2
530	7.07659	105.3	530	7.68730	104.8
540	6.91158	107.9	540	7.50530	107.5

• TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

## 1400 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DDQM BTU/LB
• 99.814	81.92764	221.0
100	81.90035	220.9
105	81.16703	218.0
110	80.43098	215.0
115	79.69192	212.0
120	78.94956	208.9
125	78.20358	205.8
130	77.45360	202.7
135	76.69925	199.5
140	75.94008	196.3
145	75.17562	193.0
150	74.40533	189.6
155	73.62863	186.2
160	72.84487	182.7
165	72.05334	179.2
170	71.25323	175.6
175	70.44366	171.9
180	69.62363	168.2
185	68.79203	164.3
190	67.94762	160.4
195	67.08899	156.4
200	66.21457	152.4
205	65.32256	148.2
210	64.41093	143.9
215	63.47736	139.6
220	62.51919	135.1
225	61.53336	130.5
230	60.51634	125.9
235	59.45573	122.3
240	58.36078	117.7
245	57.22367	112.9
250	56.03735	108.1
255	54.79367	103.2
260	53.48446	98.2
265	52.09836	93.3
270	50.61971	87.9
275	49.03092	82.7
280	47.30763	77.2
285	45.41271	71.9
290	43.31210	66.9
295	40.96535	61.3
300	38.33732	56.5
310	32.40219	49.1
320	26.79269	46.6
330	22.72948	47.5
340	19.96917	49.8
350	18.00058	52.7
360	16.51493	55.7
370	15.34344	58.7
380	14.38330	61.8
390	13.57990	64.9
400	12.89024	67.9
410	12.29052	70.9
420	11.76154	73.9
430	11.28989	76.8
440	10.86551	79.7
450	10.48068	82.6
460	10.12937	85.4
470	9.80679	88.2
480	9.50907	91.0
490	9.23304	93.7
500	8.97608	96.4
510	8.73603	99.1
520	8.51103	101.7
530	8.29951	104.4
540	8.10015	107.0

## 1500 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DDQM BTU/LB
• 99.954	81.95301	221.6
100	81.94627	221.5
105	81.21501	218.6
110	80.48113	215.7
115	79.74439	212.7
120	79.00449	209.7
125	78.26112	206.6
130	77.51394	203.5
135	76.76257	200.3
140	76.00658	197.1
145	75.24553	193.8
150	74.47891	190.5
155	73.70615	187.1
160	72.92663	183.7
165	72.13968	180.2
170	71.34453	176.6
175	70.54034	173.0
180	69.72617	169.3
185	68.90096	165.5
190	68.06355	161.7
195	67.21263	157.7
200	66.34671	153.7
205	65.46412	149.6
210	64.56300	145.4
215	63.64119	141.1
220	62.69627	136.7
225	61.72547	132.2
230	60.72560	127.7
235	59.68607	124.2
240	58.61421	119.2
245	57.50362	115.0
250	56.34852	110.4
255	55.14225	105.6
260	53.87793	100.8
265	52.54693	96.1
270	51.13708	91.0
275	49.63581	86.0
280	48.02677	80.7
285	46.27863	75.8
290	44.37643	71.2
295	42.29350	66.0
300	40.00739	61.3
310	34.87809	53.6
320	29.62522	49.5
330	25.28899	49.1
340	22.13899	50.6
350	19.85437	53.0
360	18.13298	55.7
370	16.78370	58.6
380	15.68559	61.6
390	14.77250	64.6
400	13.99428	67.6
410	13.31984	70.6
420	12.72815	73.6
430	12.20285	76.5
440	11.73147	79.4
450	11.30551	82.2
460	10.91771	85.0
470	10.56249	87.8
480	10.23535	90.6
490	9.93263	93.3
500	9.65134	96.0
510	9.38095	98.7
520	9.14337	101.4
530	8.91281	104.0
540	8.69575	106.7

• TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

1600 PSIA ISOBAR

1700 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DDDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DDDM BTU/LB
• 100.094	81.97830	222.1	• 100.234	82.00352	222.7
105	81.26278	219.3	105	81.31035	219.9
110	80.53106	216.3	110	80.58077	217.0
115	79.79660	213.4	115	79.84858	214.1
120	79.05914	210.4	120	79.11351	211.1
125	78.31836	207.3	125	78.37529	208.1
130	77.57393	204.2	130	77.63358	205.0
135	76.82550	201.1	135	76.88805	201.9
140	76.07266	197.9	140	76.13830	198.8
145	75.31497	194.7	145	75.38392	195.6
150	74.55194	191.4	150	74.62445	192.3
155	73.78305	188.1	155	73.85936	189.0
160	73.00770	184.7	160	73.08809	185.6
165	72.22524	181.2	165	72.31003	182.2
170	71.43494	177.7	170	71.52448	178.7
175	70.63601	174.1	175	70.73069	175.2
180	69.82754	170.4	180	69.92780	171.6
185	69.00856	166.7	185	69.11487	167.9
190	68.17796	162.9	190	68.29088	164.1
195	67.33449	159.0	195	67.45465	160.3
200	66.47678	155.0	200	66.60488	156.4
205	65.60328	151.0	205	65.74013	152.4
210	64.71224	146.8	210	64.85878	148.3
215	63.80168	142.6	215	63.95899	144.1
220	62.86938	138.3	220	63.03872	139.8
225	61.91281	133.9	225	62.09566	135.5
230	60.92909	129.4	230	61.12720	131.1
235	59.90938	126.1	235	60.12615	127.9
240	58.85913	121.6	240	59.09619	123.5
245	57.77304	117.1	245	58.03284	119.1
250	56.64649	112.6	250	56.93254	114.7
255	55.47408	108.0	255	55.79095	110.2
260	54.24977	103.3	260	54.60263	105.8
265	52.96697	98.8	265	53.36245	101.3
270	51.61634	93.9	270	52.06351	96.7
275	50.18855	89.2	275	50.69852	92.1
280	48.67276	84.1	280	49.26063	87.2
285	47.04040	79.5	285	47.72255	82.8
290	45.28884	75.1	290	46.09006	78.8
295	43.39836	70.2	295	44.34720	74.0
300	41.35416	65.7	300	42.48386	69.8
310	36.82238	57.9	310	38.40188	62.1
320	32.02799	53.0	320	34.03523	56.6
330	27.69106	51.3	330	29.85839	53.9
340	24.28281	51.8	340	26.33608	53.6
350	21.72227	53.7	350	23.56628	54.8
360	19.77390	56.1	360	21.41539	56.8
370	18.24651	58.8	370	19.71791	59.2
380	17.00775	61.6	380	18.34057	61.9
390	15.98163	64.5	390	17.20097	64.7
400	15.11133	67.5	400	16.23733	67.5
410	14.36094	70.4	410	15.40920	70.4
420	13.70485	73.4	420	14.68717	73.3
430	13.12362	76.2	430	14.04970	76.2
440	12.60416	79.1	440	13.48136	79.0
450	12.13585	82.0	450	12.97039	81.8
460	11.71055	84.8	460	12.50678	84.6
470	11.32184	87.6	470	12.08388	87.4
480	10.96456	90.3	480	11.69589	90.1
490	10.63456	93.0	490	11.33809	92.8
500	10.32839	95.7	500	11.06663	95.5
510	10.04323	98.4	510	10.69831	98.2
520	9.77668	101.1	520	10.41048	100.8
530	9.52674	103.7	530	10.14087	103.5
540	9.29169	106.4	540	9.88759	106.1

• TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

## 1800 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 100.375	82.02866	223.2
105	81.35773	220.6
110	80.63025	217.7
115	79.90030	214.8
120	79.16762	211.8
125	78.43192	208.8
130	77.69290	205.8
135	76.95023	202.7
140	76.20354	199.6
145	75.45242	196.4
150	74.69643	193.2
155	73.93507	189.9
160	73.16782	186.6
165	72.39408	183.2
170	71.61318	179.8
175	70.82440	176.3
180	70.02695	172.7
185	69.21993	169.1
190	68.40236	165.3
195	67.57315	161.5
200	66.73107	157.7
205	65.87477	153.7
210	65.00274	149.7
215	64.11328	145.6
220	63.20451	141.4
225	62.27430	137.1
230	61.32027	132.7
235	60.33681	129.7
240	59.32596	125.4
245	58.28379	121.1
250	57.20774	116.8
255	56.09437	112.4
260	54.93868	108.1
265	53.73652	103.8
270	52.48321	99.3
275	51.17271	94.9
280	49.80097	90.2
285	48.34167	86.0
290	46.80618	82.2
295	45.18080	77.7
300	43.45837	73.6
310	39.72466	66.0
320	35.72313	60.3
330	31.77072	56.9
340	28.25097	55.7
350	25.34991	56.3
360	23.03391	57.8
370	21.18269	59.9
380	19.67386	62.3
390	18.42352	65.0
400	17.36724	67.7
410	16.46125	70.5
420	15.67280	73.4
430	14.97818	76.2
440	14.36072	79.0
450	13.80502	81.8
460	13.30521	84.5
470	12.84763	87.3
480	12.42847	90.0
490	12.04249	92.7
500	11.68540	95.4
510	11.35364	98.0
520	11.04426	100.7
530	10.75477	103.3
540	10.48306	105.9

## 1900 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
* 100.515	82.05374	223.8
105	81.40490	221.2
110	80.67952	218.4
115	79.95179	215.5
120	79.22145	212.5
125	78.48825	209.6
130	77.75189	206.6
135	77.01204	203.5
140	76.26836	200.4
145	75.52045	197.3
150	74.76789	194.1
155	74.01022	190.9
160	73.24690	187.6
165	72.47739	184.2
170	71.70105	180.8
175	70.91719	177.3
180	70.12504	173.8
185	69.32378	170.2
190	68.51246	166.5
195	67.69006	162.8
200	66.85542	159.0
205	66.00729	155.1
210	65.14423	151.1
215	64.26469	147.0
220	63.36692	142.9
225	62.44895	138.6
230	61.50862	134.4
235	60.54176	131.4
240	59.54893	127.2
245	58.52658	123.0
250	57.47303	118.8
255	56.38593	114.6
260	55.25969	110.4
265	54.09177	106.2
270	52.87910	101.8
275	51.61646	97.6
280	50.30177	93.0
285	48.90956	89.0
290	47.45494	85.4
295	45.92573	81.1
300	44.31662	77.1
310	40.86007	69.8
320	37.16321	63.9
330	33.44525	60.0
340	30.00315	58.1
350	27.04387	58.1
360	24.60741	59.1
370	22.62556	60.9
380	20.99703	63.0
390	19.64194	65.5
400	18.49573	68.1
410	17.51307	70.8
420	16.65857	73.6
430	15.90684	76.3
440	15.24039	79.1
450	14.64143	81.8
460	14.10112	84.6
470	13.60900	87.3
480	13.16145	89.9
490	12.74702	92.6
500	12.36405	95.3
510	12.00864	97.9
520	11.67753	100.5
530	11.36799	103.2
540	11.07770	105.7

\* TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

2000 PSIA ISOBAR

2200 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 100.655	82.07874	224.3	• 100.933	82.12901	225.4
105	81.45189	221.9	105	81.54528	223.2
110	80.72858	219.0	110	80.82605	220.4
115	80.00304	216.2	115	80.10483	217.5
120	79.27503	213.3	120	79.38140	214.7
125	78.54429	210.3	125	78.65552	211.8
130	77.81055	207.3	130	77.92692	208.9
135	77.07349	204.3	135	77.19533	205.9
140	76.33278	201.3	140	76.46043	202.9
145	75.58803	198.1	145	75.72188	199.9
150	74.83886	195.0	150	74.97930	196.8
155	74.08479	191.8	155	74.23229	193.6
160	73.32535	188.5	160	73.48039	190.4
165	72.55999	185.2	165	72.72310	187.2
170	71.78811	181.8	170	71.95988	183.9
175	71.00905	178.4	175	71.19014	180.5
180	70.22210	174.9	180	70.41321	177.1
185	69.42645	171.4	185	69.62838	173.6
190	68.62122	167.7	190	68.83485	170.1
195	67.80543	164.0	195	68.03175	166.5
200	66.97801	160.2	200	67.21812	162.8
205	66.13776	156.4	205	66.39290	159.0
210	65.28337	152.5	210	65.55493	155.2
215	64.41336	148.4	215	64.70293	151.2
220	63.52611	144.3	220	63.83549	147.2
225	62.61983	140.2	225	62.95107	143.2
230	61.69252	135.9	230	62.04796	139.1
235	60.74136	133.1	235	61.12577	136.5
240	59.76555	129.0	240	60.18134	132.5
245	58.76179	124.9	245	59.21158	128.6
250	57.72921	120.8	250	58.21697	124.7
255	56.66580	116.7	255	57.19656	120.7
260	55.56719	112.6	260	56.14655	116.8
265	54.43028	108.5	265	55.06388	112.9
270	53.25414	104.3	270	53.95088	108.9
275	52.03396	100.2	275	52.80298	105.1
280	50.76904	95.8	280	51.62078	101.0
285	49.43492	91.9	285	50.38296	97.3
290	48.04897	88.5	290	49.10792	94.2
295	46.60022	84.3	295	47.78687	90.3
300	45.08456	80.4	300	46.41707	86.6
310	41.85390	73.3	310	43.53321	79.9
320	38.41132	67.4	320	40.48650	74.0
330	34.91408	63.2	330	37.36512	69.5
340	31.58896	60.8	340	34.30640	66.4
350	28.62936	60.1	350	31.45104	64.8
360	26.11763	60.7	360	28.90170	64.4
370	24.03245	62.1	370	26.69392	65.0
380	22.29974	63.9	380	24.80748	66.3
390	20.84879	66.2	390	23.19960	68.1
400	19.61740	68.6	400	21.81913	70.1
410	18.56055	71.2	410	20.62641	72.5
420	17.64130	73.9	420	19.58522	74.9
430	16.83311	76.6	430	18.66863	77.5
440	16.11824	79.3	440	17.86006	80.0
450	15.47647	82.0	450	17.13517	82.6
460	14.89760	84.7	460	16.48079	85.2
470	14.37087	87.4	470	15.88600	87.9
480	13.88977	90.1	480	15.34315	90.5
490	13.44756	92.7	490	14.84486	93.1
500	13.04196	95.2	500	14.38558	95.7
510	12.66276	97.9	510	13.96073	98.2
520	12.30980	100.5	520	13.56592	100.7
530	11.98009	103.1	530	13.19926	103.0
540	11.67112	105.6	540	12.85283	105.6

• TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

2400 PSIA ISOBAR

2600 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
* 101.211	82.17885	226.5	* 101.489	82.22849	227.6
105	81.63791	224.4	105	81.72981	225.7
110	80.92270	221.7	110	81.01853	223.0
115	80.20571	218.9	115	80.30569	220.3
120	79.48676	216.1	120	79.59112	217.5
125	78.76562	213.3	125	78.87462	214.7
130	78.04205	210.4	130	78.15596	211.9
135	77.31578	207.5	135	77.43490	209.0
140	76.58655	204.5	140	76.71117	206.2
145	75.85401	201.5	145	75.98449	203.2
150	75.11784	198.5	150	75.25453	200.2
155	74.37765	195.4	155	74.52096	197.2
160	73.63303	192.3	160	73.78338	194.2
165	72.88353	189.1	165	73.04139	191.0
170	72.12864	185.9	170	72.29453	187.9
175	71.36783	182.6	175	71.54229	184.7
180	70.60050	179.3	180	70.78414	181.4
185	69.82598	175.9	185	70.01948	178.1
190	69.04357	172.4	190	69.24767	174.7
195	68.25249	168.8	195	68.46798	171.2
200	67.45186	165.2	200	67.67965	167.7
205	66.64076	161.6	205	66.88183	164.1
210	65.81814	157.8	210	66.07361	160.4
215	64.98288	154.0	215	65.25398	156.6
220	64.13375	150.1	220	64.42185	152.8
225	63.26941	146.1	225	63.57604	148.9
230	62.38839	142.1	230	62.71529	145.0
235	61.49228	139.7	235	61.84278	142.9
240	60.57611	135.9	240	60.95213	139.2
245	59.63675	132.2	245	60.04021	135.6
250	58.67575	128.4	250	59.10928	132.0
255	57.69284	124.6	255	58.15945	128.3
260	56.68499	120.8	260	57.18874	124.7
265	55.64838	117.0	265	56.19195	121.0
270	54.58825	113.3	270	55.17691	117.5
275	53.49991	109.7	275	54.13875	114.0
280	52.38390	105.8	280	53.07701	110.4
285	51.22340	102.3	285	51.98061	107.0
290	50.03454	99.5	290	50.86107	104.4
295	48.81101	95.8	295	49.71493	100.9
300	47.55662	92.3	300	48.54026	97.6
310	44.92166	85.9	310	46.10756	91.4
320	42.16698	80.2	320	43.57679	85.9
330	39.33981	75.5	330	40.98162	81.2
340	36.53002	72.0	340	38.38447	77.5
350	33.83530	69.8	350	35.85533	74.9
360	31.34467	68.7	360	33.46539	73.3
370	29.10819	68.6	370	31.26082	72.6
380	27.14042	69.3	380	29.27031	72.7
390	25.42709	70.6	390	27.49912	73.5
400	23.93342	72.2	400	25.93011	74.8
410	22.62841	74.2	410	24.54105	76.4
420	21.48096	76.4	420	23.30799	78.3
430	20.46616	78.8	430	22.20945	80.4
440	19.57026	81.2	440	21.23503	82.6
450	18.76727	83.6	450	20.36050	85.0
460	18.04128	86.1	460	19.56855	87.4
470	17.38138	88.7	470	18.84795	89.8
480	16.77903	91.2	480	18.18963	92.2
490	16.22640	93.8	490	17.58547	94.7
500	15.71735	96.3	500	17.02891	97.1
510	15.24677	98.8	510	16.51428	99.6
520	14.80986	101.3	520	16.03657	102.0
530	14.40178	103.7	530	15.59090	104.4
540	14.01978	106.1	540	15.17371	106.8

• TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

2800 PSIA ISOBAR

3000 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 101.766	82.27794	228.7	• 102.042	82.32720	229.8
105	81.82099	227.0	105	81.91146	228.2
110	81.11356	224.3	110	81.20782	225.6
115	80.40480	221.6	115	80.50305	223.0
120	79.69452	218.9	120	79.79698	220.3
125	78.98256	216.2	125	79.08945	217.6
130	78.26869	213.4	130	78.38027	214.9
135	77.55270	210.6	135	77.66924	212.1
140	76.83435	207.8	140	76.95612	209.4
145	76.11336	204.9	145	76.24067	206.5
150	75.38944	202.0	150	75.52263	203.7
155	74.66228	199.0	155	74.80169	200.8
160	73.93152	196.0	160	74.07753	197.8
165	73.19679	193.0	165	73.34981	194.8
170	72.45765	189.9	170	72.61814	191.8
175	71.71367	186.7	175	71.88209	188.7
180	70.96433	183.5	180	71.14121	185.6
185	70.20910	180.2	185	70.39501	182.4
190	69.44738	176.9	190	69.64295	179.1
195	68.67853	173.5	195	68.88443	175.8
200	67.90186	170.1	200	68.11882	172.4
205	67.11659	166.5	205	67.34542	168.9
210	66.32190	162.9	210	66.56350	165.4
215	65.51690	159.2	215	65.77224	161.8
220	64.70061	155.5	220	64.97077	158.1
225	63.87200	151.7	225	64.15817	154.4
230	63.02994	147.8	230	63.33343	150.5
235	62.17885	145.9	235	62.50185	148.9
240	61.31133	142.5	240	61.65533	145.6
245	60.42437	138.9	245	60.79121	142.2
250	59.52058	135.4	250	59.91214	138.8
255	58.60022	131.9	255	59.01824	135.4
260	57.66266	128.3	260	58.11059	131.9
265	56.70079	124.8	265	57.17973	128.5
270	55.72477	121.4	270	56.23790	125.2
275	54.72964	118.1	275	55.28020	122.0
280	53.71342	114.8	280	54.30293	118.9
285	52.67134	111.4	285	53.30763	115.6
290	51.60910	109.1	290	52.29382	113.5
295	50.52616	105.7	295	51.26365	110.2
300	49.42082	102.5	300	50.21578	107.2
310	47.14461	96.7	310	48.06772	101.6
320	44.79107	91.3	320	45.85019	96.4
330	42.38253	86.7	330	43.60285	91.8
340	39.96366	82.9	340	41.33400	87.9
350	37.58704	79.9	350	39.09267	84.9
360	35.30862	77.9	360	36.92255	82.6
370	33.16740	76.8	370	34.85721	81.2
380	31.19390	76.5	380	32.92405	80.5
390	29.40249	76.9	390	31.13933	80.5
400	27.79133	77.7	400	29.51164	81.0
410	26.34620	79.0	410	28.03436	81.9
420	25.05003	80.6	420	26.69615	83.1
430	23.88499	82.4	430	25.48238	84.7
440	22.84311	84.4	440	24.38586	86.5
450	21.90493	86.6	450	23.39313	88.5
460	21.05389	88.9	460	22.49063	90.6
470	20.27807	91.2	470	21.66572	92.8
480	19.56826	93.5	480	20.90952	95.0
490	18.91616	95.9	490	20.21364	97.3
500	18.31505	98.3	500	19.57142	99.6
510	17.75872	100.7	510	18.97627	101.9
520	17.24207	103.0	520	18.42301	104.2
530	16.76071	105.4	530	17.90808	106.5
540	16.31004	107.7	540	17.42591	108.8

• TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

3200 PSIA ISOBAR

3400 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 102.318	82.37628	230.9	• 102.594	82.42517	232.0
105	82.00124	229.5	105	82.09033	230.8
110	81.30132	226.9	110	81.39407	228.2
115	80.60046	224.3	115	80.69705	225.7
120	79.89852	221.7	120	79.99915	223.1
125	79.19533	219.1	125	79.30023	220.5
130	78.49074	216.4	130	78.60011	217.9
135	77.78454	213.7	135	77.89864	215.2
140	77.07653	210.9	140	77.19561	212.5
145	76.36648	208.2	145	76.49083	209.8
150	75.65414	205.4	150	75.78404	207.1
155	74.93925	202.5	155	75.07502	204.3
160	74.22149	199.6	160	74.36347	201.4
165	73.50056	196.7	165	73.64911	198.6
170	72.77608	193.7	170	72.93160	195.7
175	72.04769	190.7	175	72.21058	192.7
180	71.31495	187.6	180	71.48568	189.7
185	70.57741	184.5	185	70.75646	186.6
190	69.83458	181.3	190	70.02248	183.5
195	69.08591	178.0	195	69.28323	180.3
200	68.33083	174.7	200	68.53818	177.0
205	67.56870	171.3	205	67.78676	173.7
210	66.79885	167.9	210	67.02833	170.3
215	66.02053	164.3	215	66.26224	166.8
220	65.23297	160.7	220	65.48777	163.2
225	64.43533	157.0	225	64.70415	159.6
230	63.62670	153.2	230	63.91057	155.9
235	62.81293	151.8	235	63.11312	154.7
240	61.98550	148.7	240	62.30304	151.7
245	61.14242	145.4	245	61.47944	148.5
250	60.28602	142.0	250	60.64397	145.2
255	59.41605	138.8	255	59.79577	142.1
260	58.53566	135.3	260	58.94043	138.7
265	57.63263	132.0	265	58.06259	135.5
270	56.72104	128.9	270	57.17800	132.4
275	55.79830	125.8	275	56.28258	129.4
280	54.85290	122.8	280	55.36932	126.6
285	53.89843	119.6	285	54.45058	123.4
290	52.92636	117.6	290	53.51516	121.6
295	51.94105	114.5	295	52.56851	118.6
300	50.94171	111.6	300	51.61077	115.8
310	48.90086	106.2	310	49.66115	110.7
320	46.81087	101.3	320	47.67224	105.9
330	44.68357	96.8	330	45.65351	101.5
340	42.54218	92.8	340	43.62161	97.5
350	40.41961	89.6	350	41.60324	94.2
360	38.34950	87.2	360	39.62382	91.7
370	36.36224	85.5	370	37.71195	89.8
380	34.48114	84.5	380	35.88727	88.5
390	32.72109	84.2	390	34.16314	87.9
400	31.09510	84.4	400	32.55135	87.9
410	29.60393	85.0	410	31.05925	88.3
420	28.24109	86.0	420	29.68479	89.0
430	26.99478	87.3	430	28.41911	90.1
440	25.85729	88.8	440	27.25383	91.3
450	24.82006	90.6	450	26.18264	92.9
460	23.87405	92.6	460	25.20113	94.7
470	23.00654	94.6	470	24.29761	96.6
480	22.20937	96.7	480	23.46501	98.6
490	21.47418	98.9	490	22.69510	100.6
500	20.79456	101.1	500	21.98192	102.8
510	20.16383	103.3	510	21.31904	104.9
520	19.57669	105.6	520	20.70100	107.1
530	19.03041	107.8	530	20.12558	109.3
540	18.51878	110.0	540	19.58652	111.4

\* TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

## 3600 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 102.869	82.47388	233.1
105	82.17876	232.0
110	81.48608	229.5
115	80.79284	227.0
120	80.09891	224.5
125	79.40415	221.9
130	78.70843	219.3
135	78.01157	216.7
140	77.31341	214.1
145	76.61375	211.4
150	75.91238	208.7
155	75.20906	206.0
160	74.50354	203.2
165	73.79554	200.4
170	73.08477	197.5
175	72.37088	194.6
180	71.65352	191.7
185	70.93231	188.7
190	70.20682	185.6
195	69.47658	182.5
200	68.74112	179.3
205	67.99989	176.0
210	67.25232	172.6
215	66.49780	169.2
220	65.73567	165.7
225	64.96524	162.1
230	64.18575	158.4
235	63.40328	157.5
240	62.60899	154.7
245	61.80351	151.5
250	60.98746	148.3
255	60.15920	145.3
260	59.32704	141.9
265	58.47219	138.8
270	57.61188	135.9
275	56.74277	132.9
280	55.85660	130.1
285	54.96946	127.1
290	54.06674	125.4
295	53.15383	122.5
300	52.23216	119.9
310	50.36125	115.0
320	48.45916	110.4
330	46.53360	106.0
340	44.59669	102.1
350	42.67007	98.7
360	40.77259	96.0
370	38.93146	94.0
380	37.16327	92.6
390	35.48128	91.7
400	33.89232	91.5
410	32.40819	91.7
420	31.03120	92.2
430	29.75589	93.1
440	28.57421	94.1
450	27.47937	95.4
460	26.47020	97.0
470	25.53719	98.7
480	24.67468	100.6
490	23.87465	102.6
500	23.13175	104.6
510	22.44016	106.6
520	21.79434	108.7
530	21.19195	110.9
540	20.62741	113.0

## 3800 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 103.143	82.52241	234.2
105	82.26653	233.3
110	81.57738	230.8
115	80.88784	228.3
120	80.19780	225.8
125	79.50713	223.3
130	78.81570	220.8
135	78.12336	218.2
140	77.42996	215.7
145	76.73530	213.0
150	76.03919	210.4
155	75.34143	207.7
160	74.64176	205.0
165	73.93994	202.2
170	73.23569	199.4
175	72.52869	196.6
180	71.81861	193.7
185	71.10510	190.7
190	70.38776	187.7
195	69.66617	184.6
200	68.93987	181.5
205	68.20836	178.3
210	67.47112	175.0
215	66.72758	171.6
220	65.97713	168.1
225	65.21913	164.6
230	64.45290	160.9
235	63.68419	160.2
240	62.90425	157.6
245	62.11572	154.5
250	61.31779	151.3
255	60.50785	148.4
260	59.69729	145.1
265	58.86358	142.1
270	58.02522	139.2
275	57.17989	136.3
280	56.31867	133.5
285	55.45930	130.6
290	54.58628	129.0
295	53.70311	126.3
300	52.81299	123.7
310	51.01078	119.0
320	49.18431	114.6
330	47.33945	110.4
340	45.48567	106.5
350	43.64020	103.0
360	41.81701	100.3
370	40.04148	98.2
380	38.32744	96.6
390	36.69006	95.5
400	35.12996	95.0
410	33.66009	95.1
420	32.28688	95.5
430	31.00856	96.2
440	29.81915	97.0
450	28.70997	98.1
460	27.68065	99.5
470	26.72449	101.0
480	25.83742	102.8
490	25.01182	104.6
500	24.24302	106.5
510	23.52601	108.5
520	22.85546	110.5
530	22.22830	112.6
540	21.64015	114.7

\* TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

4000 PSIA ISOBAR

4200 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
* 103.417	82.57076	235.3	* 103.690	82.61894	236.3
105	82.35366	234.5	105	82.44016	235.7
110	81.66798	232.1	110	81.75789	233.4
115	80.98208	229.7	115	81.07556	231.0
120	80.29585	227.2	120	80.39308	228.6
125	79.60919	224.7	125	79.71035	226.1
130	78.92197	222.3	130	79.02724	223.7
135	78.23405	219.7	135	78.34365	221.2
140	77.54528	217.2	140	77.65942	218.8
145	76.85551	214.6	145	76.97441	216.2
150	76.16454	212.0	150	76.28845	213.7
155	75.47217	209.4	155	75.60135	211.1
160	74.77820	206.8	160	74.91291	208.5
165	74.08237	204.0	165	74.22290	205.8
170	73.38443	201.3	170	73.53109	203.1
175	72.68410	198.5	175	72.83721	200.4
180	71.98106	195.7	180	72.14096	197.6
185	71.27497	192.8	185	71.44204	194.8
190	70.56548	189.8	190	70.74010	191.9
195	69.85218	186.8	195	70.03477	188.9
200	69.13465	183.7	200	69.32566	185.8
205	68.41244	180.5	205	68.61233	182.7
210	67.68504	177.3	210	67.89433	179.5
215	66.95193	173.9	215	67.17117	176.2
220	66.21256	170.5	220	66.44231	172.8
225	65.46631	167.0	225	65.70720	169.4
230	64.71256	163.4	230	64.96525	165.8
235	63.95654	162.9	235	64.22094	165.5
240	63.18964	160.4	240	63.46586	163.2
245	62.41698	157.4	245	62.70815	160.3
250	61.63605	154.3	250	61.94320	157.2
255	60.84304	151.5	255	61.16589	154.5
260	60.05270	148.1	260	60.39461	151.2
265	59.23854	145.2	265	59.59863	148.3
270	58.42018	142.5	270	58.79854	145.6
275	57.59549	139.7	275	57.99466	142.9
280	56.75877	136.8	280	57.17924	139.9
285	55.92358	134.1	285	56.36512	137.4
290	55.07797	132.5	290	55.54524	135.8
295	54.22124	129.8	295	54.471219	133.3
300	53.35893	127.4	300	53.87450	131.0
310	51.61723	123.0	310	52.18651	126.8
320	49.85744	118.6	320	50.48622	122.5
330	48.08301	114.6	330	48.77359	118.7
340	46.30247	110.8	340	47.05795	114.9
350	44.52910	107.3	350	45.34887	111.5
360	42.77371	104.4	360	43.65585	108.5
370	41.05882	102.1	370	41.99713	106.0
380	39.39537	100.5	380	40.38011	104.5
390	37.80215	99.3	390	38.82834	103.2
400	36.27524	98.6	400	37.33794	102.2
410	34.82440	98.4	410	35.90991	101.8
420	33.45969	98.7	420	34.55777	101.9
430	32.18269	99.3	430	33.28506	102.4
440	30.99098	100.1	440	32.09324	103.2
450	29.87506	101.0	450	30.97601	104.0
460	28.83262	102.1	460	29.92687	104.9
470	27.85937	103.5	470	28.94223	106.1
480	26.95293	105.0	480	28.02136	107.5
490	26.10618	106.8	490	27.15775	109.0
500	25.31522	108.6	500	26.34831	110.7
510	24.57581	110.5	510	25.58910	112.6
520	23.88340	112.4	520	24.87738	114.5
530	23.23373	114.5	530	24.20767	116.4
540	22.62386	116.5	540	23.57801	118.4

\* TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

4400 PSIA ISOBAR

4600 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DDDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DDDM BTU/LB
• 103.962	82.66694	237.4	• 104.235	82.71478	238.5
105	82.52604	237.0	105	82.61132	238.2
110	81.84713	234.6	110	81.93570	235.9
115	81.16831	232.3	115	81.26033	233.6
120	80.48951	229.9	120	80.58514	231.3
125	79.81062	227.5	125	79.91004	228.9
130	79.13156	225.1	130	79.23493	226.6
135	78.45219	222.7	135	78.55971	224.2
140	77.77241	220.3	140	77.88426	221.8
145	77.09205	217.8	145	77.20846	219.4
150	76.41097	215.3	150	76.53215	216.9
155	75.72900	212.8	155	75.85518	214.5
160	75.04595	210.2	160	75.17736	211.9
165	74.36160	207.6	165	74.49852	209.4
170	73.67573	205.0	170	73.81842	206.8
175	72.98810	202.3	175	73.13685	204.2
180	72.29842	199.6	180	72.45354	201.5
185	71.60642	196.8	185	71.76822	198.7
190	70.91176	193.9	190	71.08059	195.9
195	70.21410	191.0	195	70.39032	193.1
200	69.51307	188.0	200	69.69706	190.1
205	68.80827	184.9	205	69.00043	187.1
210	68.09925	181.8	210	68.30002	184.0
215	67.38557	178.5	215	67.59540	180.8
220	66.66672	175.2	220	66.88610	177.4
225	65.94219	171.7	225	66.17162	174.0
230	65.21141	168.2	230	65.45145	170.5
235	64.47792	164.1	235	64.72797	170.6
240	63.73355	160.9	240	63.99327	168.5
245	62.98995	163.1	245	63.26302	165.9
250	62.24011	160.1	250	62.52753	162.9
255	61.47742	157.4	255	61.77848	160.2
260	60.72415	154.1	260	61.04232	157.0
265	59.94517	151.3	265	60.27929	154.2
270	59.16186	148.7	270	59.51146	151.8
275	58.37620	146.1	275	58.74293	149.2
280	57.58259	142.8	280	57.97057	145.7
285	56.78630	140.8	285	57.18908	144.1
290	55.99095	139.1	290	56.41751	142.2
295	55.17926	136.6	295	55.62520	139.8
300	54.36345	134.4	300	54.82885	137.8
310	52.72341	130.4	310	53.23185	133.9
320	51.07677	126.3	320	51.63408	129.9
330	49.41858	122.6	330	50.02394	126.4
340	47.76068	119.0	340	48.41757	122.9
350	46.10915	115.6	350	46.81768	119.7
360	44.47395	112.5	360	45.23653	116.3
370	42.86749	109.8	370	43.67892	113.6
380	41.29250	108.3	380	42.14159	112.2
390	39.77774	107.1	390	40.65808	111.1
400	38.32525	105.8	400	39.24485	109.5
410	36.92442	105.1	410	37.87462	108.5
420	35.58903	105.0	420	36.56070	108.0
430	34.32299	105.5	430	35.30384	108.3
440	33.13026	106.4	440	34.10679	109.7
450	32.01476	107.1	450	32.99372	110.4
460	30.96463	107.8	460	31.94755	110.9
470	29.97387	108.8	470	30.95539	111.7
480	29.04321	110.1	480	30.01928	112.8
490	28.16690	111.4	490	29.13423	114.0
500	27.34256	113.0	500	28.29850	115.4
510	26.55569	114.8	510	27.50557	117.2
520	25.83673	116.7	520	26.76091	119.0
530	25.14975	118.5	530	26.05979	120.7
540	24.50241	120.4	540	25.39720	122.5

• TWO-PHASE BOUNDARY

TABLE II. SPECIFIC HEAT INPUT OF OXYGEN.

4800 PSIA ISOBAR

5000 PSIA ISOBAR

TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB	TEMPERATURE DEG. R	DENSITY LB/CU FT	DQDM BTU/LB
• 104.506	82.76245	239.6	• 104.777	82.80994	240.7
105	82.69600	239.4	105	82.78009	240.6
110	82.02363	237.1	110	82.11091	238.4
115	81.35165	234.9	115	81.44227	236.2
120	80.68000	232.6	120	80.77411	233.9
125	80.00861	230.3	125	80.10636	231.7
130	79.33738	228.0	130	79.43893	229.4
135	78.66622	225.7	135	78.77175	227.1
140	77.99502	223.3	140	78.10471	224.8
145	77.32367	221.0	145	77.43770	222.5
150	76.65201	218.6	150	76.77060	220.2
155	75.97992	216.1	155	76.10326	217.8
160	75.30721	213.7	160	75.43554	215.4
165	74.63372	211.2	165	74.76725	212.9
170	73.95923	208.6	170	74.09822	210.4
175	73.28354	206.0	175	73.42823	207.9
180	72.60639	203.4	180	72.75707	205.3
185	71.92754	200.7	185	72.08448	202.6
190	71.24670	197.9	190	71.41020	199.9
195	70.56355	195.1	195	70.73393	197.1
200	69.87777	192.2	200	70.05536	194.3
205	69.18900	189.2	205	69.37414	191.3
210	68.49684	186.1	210	68.68991	188.3
215	67.80090	183.0	215	68.00228	185.2
220	67.10071	179.7	220	67.31082	181.9
225	66.39583	176.3	225	66.61509	178.6
230	65.68574	172.8	230	65.91461	175.1
235	64.97152	170.1	235	65.20898	175.5
240	64.24553	171.1	240	64.49079	173.7
245	63.52797	168.7	245	63.78531	171.4
250	62.80611	165.6	250	63.07645	166.4
255	62.06984	163.0	255	62.35220	165.8
260	61.35000	159.9	260	61.64795	162.8
265	60.60201	157.0	265	60.91420	159.8
270	59.84849	154.7	270	60.17397	157.6
275	59.09529	152.2	275	59.43532	155.1
280	58.34486	149.4	280	58.70716	151.1
285	57.57515	147.4	285	57.94593	150.9
290	56.82696	145.2	290	57.22107	148.1
295	56.05233	142.8	295	56.46265	145.8
300	55.27331	141.0	300	55.69902	144.1
310	53.71505	137.3	310	54.17574	140.6
320	52.16223	133.3	320	52.66453	136.7
330	50.59457	130.2	330	51.13449	133.8
340	49.03426	126.8	340	49.61541	130.6
350	47.48078	123.6	350	48.10370	127.5
360	45.95052	120.1	360	46.62166	123.9
370	44.43888	117.3	370	45.15354	121.0
380	42.93493	116.2	380	43.67895	120.3
390	41.47596	115.2	390	42.23714	119.3
400	40.10220	113.3	400	40.90227	117.1
410	38.76624	112.0	410	39.60409	115.4
420	37.47929	111.0	420	38.35047	113.8
430	36.23466	111.1	430	37.12212	113.6
440	35.02771	112.9	440	35.89784	116.3
450	33.91564	113.8	450	34.78353	117.3
460	32.87755	114.1	460	33.75686	117.4
470	31.88817	114.7	470	32.77384	117.8
480	30.95057	115.6	480	31.83830	118.5
490	30.06054	116.6	490	30.94678	119.4
500	29.21682	117.9	500	30.09838	120.5
510	28.40892	119.7	510	29.27605	122.3
520	27.64949	121.5	520	28.50220	124.2
530	26.93779	123.0	530	27.78387	125.5
540	26.26274	124.7	540	27.09959	126.9

• TWO-PHASE BOUNDARY

# NBS TECHNICAL PUBLICATIONS

## PERIODICALS

**JOURNAL OF RESEARCH** reports National Bureau of Standards research and development in physics, mathematics, chemistry, and engineering. Comprehensive scientific papers give complete details of the work, including laboratory data, experimental procedures, and theoretical and mathematical analyses. Illustrated with photographs, drawings, and charts.

*Published in three sections, available separately:*

### ● Physics and Chemistry

Papers of interest primarily to scientists working in these fields. This section covers a broad range of physical and chemical research, with major emphasis on standards of physical measurement, fundamental constants, and properties of matter. Issued six times a year. Annual subscription: Domestic, \$5.00; foreign, \$6.00\*.

### ● Mathematical Sciences

Studies and compilations designed mainly for the mathematician and theoretical physicist. Topics in mathematical statistics, theory of experiment design, numerical analysis, theoretical physics and chemistry, logical design and programming of computers and computer systems. Short numerical tables. Issued quarterly. Annual subscription: Domestic, \$2.25; foreign, \$2.75\*.

### ● Engineering and Instrumentation

Reporting results of interest chiefly to the engineer and the applied scientist. This section includes many of the new developments in instrumentation resulting from the Bureau's work in physical measurement, data processing, and development of test methods. It will also cover some of the work in acoustics, applied mechanics, building research, and cryogenic engineering. Issued quarterly. Annual subscription: Domestic, \$2.75; foreign, \$3.50\*.

## TECHNICAL NEWS BULLETIN

The best single source of information concerning the Bureau's research, developmental, cooperative and publication activities, this monthly publication is designed for the industry-oriented individual whose daily work involves interaction with science and technology for engineers, chemists, physicists, research managers, product development managers, and company executives. Annual subscription: Domestic, \$1.50; foreign, \$2.25\*.

\*Difference in price is due to extra cost of foreign mailing.

## NONPERIODICALS

**Applied Mathematics Series.** Mathematical tables, manuals, and studies.

**Building Science Series.** Research results, test methods, and performance criteria of building materials, components, systems, and structures.

**Handbooks.** Recommended codes of engineering and industrial practice (including safety codes) developed in cooperation with interested industries, professional organizations, and regulatory bodies.

**Special Publications.** Proceedings of NBS conferences, bibliographies, annual reports, wall charts, pamphlets, etc.

**Monographs.** Major contributions to the technical literature on various subjects related to the Bureau's scientific and technical activities.

**National Standard Reference Data Series.** NSRDS provides quantitative data on the physical and chemical properties of materials, compiled from the world's literature and critically evaluated.

**Product Standards.** Provide requirements for sizes, types, quality and methods for testing various industrial products. These standards are developed cooperatively with interested Government and industry groups and provide the basis for common understanding of product characteristics for both buyers and sellers. Their use is voluntary.

**Technical Notes.** This series consists of communications and reports (covering both other agency and NBS-sponsored work) of limited or transitory interest.

## CLEARINGHOUSE

The Clearinghouse for Federal Scientific and Technical Information, operated by NBS, supplies unclassified information related to Government-generated science and technology in defense, space, atomic energy, and other national programs. For further information on Clearinghouse services, write:

Clearinghouse  
U.S. Department of Commerce  
Springfield, Virginia 22151

Order NBS publications from:  
Superintendent of Documents  
Government Printing Office  
Washington, D.C. 20402

U.S. DEPARTMENT OF COMMERCE

WASHINGTON, D.C. 20585

TELEGRAMS: COMM-FAX

POSTAGE AND FEES PAID

U.S. DEPARTMENT OF COMMERCE